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IN THIS ISSUE:

Modern Fertilizer Technology

VIGNETTE

TECHICAL DIRECTOR

MAYNARD BALDWIN

The advance of science and technology is reflected in their growing complexity. Workers in one field find it increasingly necessary to depend upon the knowledge and know-how of workers in other disciplines. In the view of Maynard Baldwin, Battelle technical director, those in research must give appreciable time and thought to this matter if progress in science and technology is to continue. They must strive always for better planning of research, for better techniques for coordinating the efforts of the participating technologists, and for more effective oral and written communications among cooperating technologists and between them and other interested persons.

With his multiplying responsibilities at Battelle, Maynard has been increasingly cognizant of the growing tendency of technical fields to overlap. Originally concerned with chemical problems, he has found that investigations with which he is concerned often touch such diverse fields as metallurgy and the biosciences. Maynard has participated in varied investigations since he joined the Institute staff in 1938. Included have been those involving organo-metallic compounds; the hydrogenation of coal tar, pitch, and related materials; the oxidation of olefins; organic-chemical synthesis; catalysis; leather chemistry; and the application of mineral and organic compounds to such end-uses as preservatives, fungicides, herbicides, and insecticides.

Prior to his association with Battelle, Maynard served as research associate at the School of Mineral Industries of Pennsylvania State College (now University), where he studied the chemistry of coal hydrogenation. Earlier, he had received his Ph.D. in chemistry from the University of Washington after graduating from Whitman College with a B.S. in chemistry.

His investigations have resulted in four patents and three others pending. Those studies also have served as a basis for several published papers.

Maynard's interests are also reflected in his professional society memberships. In addition to the American Chemical Society, he is active in the American Leather Chemists Association, the Society for Industrial Microbiology, and the Chemist Club of New York.

He and his wife Eleanor have three sons—one a college graduate, one a college student, and the third in high school. Not a man for exhausting hobbies (although we recall that he once played a sharp game of tennis), Maynard enjoys relaxing while listening to hi-fi. His record collection is one of which to be proud.

Modern Fertilizer Technology

In recent years, fertilizer technology has taken great strides forward. Further improvements will be required to meet the future needs of American agriculture. The author reports what the fertilizer industry is now doing to meet these needs and discusses other steps that may be taken in the future.

by George F. Sachsel

In spite of declining farm population and stationary farm acreage, American agriculture has succeeded in more than meeting the country's food and raw material needs. While most of the credit for this success belongs to the farmers, the contribution of others should not be overlooked. Of great importance in the picture is the group of manufacturers who make up the fertilizer industry of the United States. By their improvement of their product, as well as by increasing production, they have helped to make possible what is almost a miracle of agricultural production.

What is connoted by the word "fertilizer" has changed significantly during the last century. Originally the term referred to human and animal wastes. Now fertilizer refers primarily to a group of chemicals that can supply plants with one or more of the primary nutrients, nitrogen, phosphorus, and potassium, and which may contain such secondary nutrients as calcium, magnesium, and sulfur, as well as small quantities of so-called trace elements such as zinc, boron, iron, manganese, copper, and molybdenum.

Fertilizer Economics

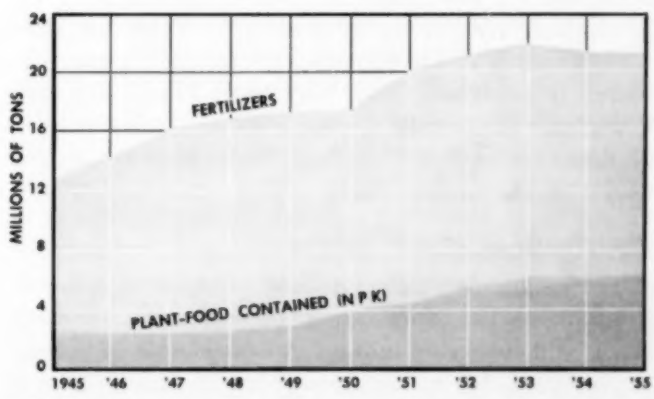
Fertilizer manufacture is big business. Today, for instance, farmers spend well over a billion dollars to buy over 22 million tons of fertilizer. A rising standard of living demanding more and more secondary products of agriculture such as meat, eggs, and milk, in addition to the demand for staple crops, all tend to increase the demand for fertilizer and thus assure the industry a bright future.

Adjustment of the agricultural economy from the overexpansion of World War II and a program of government subsidies to a domestic market that is becoming relatively free, has introduced an element of competition into the fertilizer industry. This in turn has focused attention on the costs of manufacturing fertilizer and on ways of cutting these costs.

The graphic chart on page 5 shows the approximate distribution of costs for a conventional mixed fertilizer plant, believed to be representative of many plants in existence at the close of World War II. The cost distribution is characteristic of heavy-chemicals operations, with over 70 per cent represented by raw materials, some 18 per cent connected with distribution (including packaging, shipping, sales, advertising, etc.), and the remaining ten per cent or so split almost evenly between administration and processing. These figures identify the major targets for cost reduction—raw materials and distribution. Recent changes in fertilizer technology, by providing more concentrated raw materials at lower cost, and by converting fertilizers into physical forms that are more easily handled, have helped reduce both raw materials and distribution costs.

Technological Changes

In the last 25 years, a number of changes have taken place in fertilizer technology which have led to great improvements both in production processes and in the fertilizer products. Changes have been uneven among the major plant nutrients, with those in the field of nitrogen materials most drastic. The following dis-



Total fertilizer production and tons of plant food contained in fertilizers. Since 1953, though total production has decreased, the tonnage of plant food continued to rise.

cussion deals with significant technical developments and possibilities.

Nitrogen

The most startling changes have occurred in the field of nitrogen materials, largely as a consequence of the development of the synthetic ammonia industry and related industries. The chart to the right shows that today's nitrogen materials are two to ten times as concentrated as those in use at the turn of the century, all of them containing over 30 per cent nitrogen with anhydrous ammonia, at 82 per cent, topping the list. The use of anhydrous ammonia has been made possible by improvements in liquid-solids blending and reacting equipment, such as the TVA ammoniator, which allows safe and economical use of anhydrous ammonia in manufacture of mixed fertilizers, and by development of techniques and equipment for direct application of anhydrous ammonia to the soil.

Constant improvement in methods for producing ammonia, ammonium nitrate, and urea, have created a strongly competitive situation among these materials which is likely to lead to further lowering of unit prices for nitrogen materials. Among process improvements, the most recent ones are the Texaco process for synthesis gas preparation, the Casale ammonia process with 100 ton-per-day converters, improved versions of the high-pressure Claude ammonia process, improved urea processes offered by Chemical Construction Corporation, Montecatini, Pechiney, and Inventa, and the Commercial Solvents Stenzel process for making anhydrous, molten ammonium nitrate by direct reaction of anhydrous ammonia and 58 per cent nitric acid. Prilling or shotting, originally developed by Consolidated Mining and Smelting Corporation for ammonium nitrate, has been applied successfully to urea, reducing the handling problems for this material.

Direct nitrogen fixation, by oxidation of the nitrogen in the air, first accomplished by use of an electric arc, has received new impetus by development of a regenerative-pebble-furnace process by Frederick Cottrell, Farrington Daniels, the Wisconsin Alumni Research Foundation, and the Food Machinery and Chemical Corporation. Recent work at the Brookhaven National Laboratories has suggested a path to nitrogen oxidation via nuclear energy.

Phosphorus

The major source for fertilizer phosphorus today is the same as 100 years ago: phosphate rock. Much of this is still converted into a fertilizer material (normal superphosphate) by simple addition of sulfuric acid, a method developed by John Lowes in England during the last century. Substantial improvements in batch equipment have been made, however, and a number of continuous processes have been made possible by development of units such as the Broadfield den, the Sackett acidulating tower and the TVA cone mixer. Use of wet-process phosphoric acid, produced by reacting sulfuric acid and phosphate rock, and separating gypsum from the resultant phosphoric acid solution, led to a gypsum-free superphosphate more than twice as concentrated as the old normal superphosphate. Most new phosphate fertilizer plants being put in today are based on this process. Granulating of both normal and concentrated superphosphate has reduced the users' handling costs. A variety of procedures developed for quick curing of superphosphates give some promise of more efficient utilization of acidulation capacity, and of reducing the requirements for costly storage space. Improvements in recovery of fluoride

NITROGEN

Animal Wastes to Concentrated Synthetics

Period	Nitrogen Materials	Nitrogen Concentration (per cent)
19th Century	Manures, Tankage	3-15
To World War I	Sodium Nitrate (Chile Saltpeter)	16
To World War II	Cyanamid Ammonium Nitrate	20
World War II to present	Ammonium Nitrate Nitrogen Solutions Urea Anhydrous Ammonia	33.5 35.49 45 82

George Sachsel, author of several papers on fertilizer technology, has engaged in diverse research and development studies of unit processes. Among these are manufacturing processes for such products as nitric and phosphoric acids, ammonia, urea, and liquid air. His fields of interest are broad enough to embrace such varied studies as benzene desulfurization, leaching processes for recovery of metals, fertilizer granulation, and hydrazine production. He regularly participates in technical and economic appraisals, as well as cost estimations, of chemical processes.

fumes from phosphate rock acidulation plants have not only made the neighbors of fertilizer plants happier, but have also created a source for low-cost fluorine compounds for city-water fluoridation.

Electric-furnace phosphorus, long considered too costly for fertilizer use, shows some signs of finding at least a limited market in this field. Phosphoric acid obtained via the furnace route, although not competitive yet with wet-process acid, is being used by some coke-oven gas producers who require high-purity acid for ease of operation to convert from the slow-selling low-nitrogen ammonium sulfate to the more saleable ammonium phosphate. Direct reaction of phosphorus, ammonia, steam, and air has been explored by TVA and is reported to yield ammonium metaphosphate, a material containing almost 88 per cent primary nutrients.

Direct application of phosphoric acid, both wet-process and furnace-grade, has been explored and this may be another step in eventual transition from solids-handling to liquids-handling in fertilizer application on the farm.

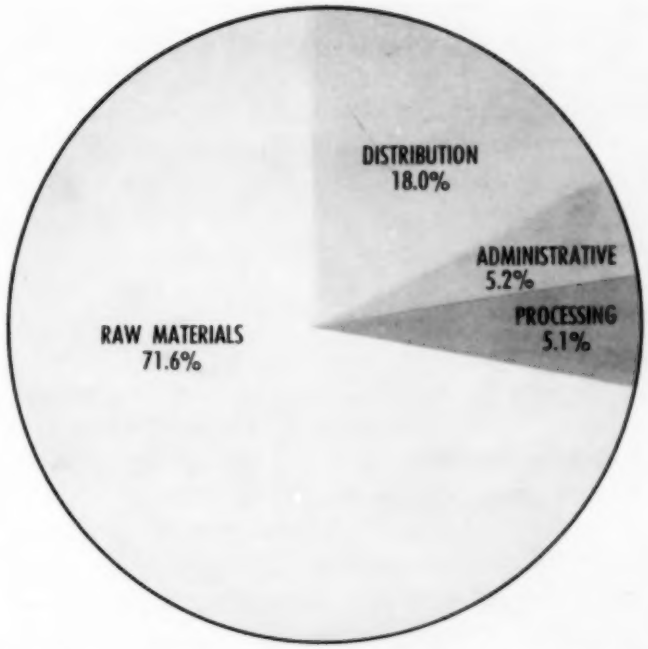
Electric furnace production of calcium metaphosphate, demonstrated some time ago by TVA and now being done commercially in Idaho, may offer competition to the superphosphates if accepted by agronomists. A concentrated material (over 71 per cent nutrient versus about 45 per cent concentrated superphosphate), it is reported to be effective on acid and neutral soils, but less valuable on alkaline soils. This latter problem has been overcome to some extent by hydrolyzing the metaphosphate with some dilute sulfuric acid to produce a material equivalent to concentrated superphosphate.

Potassium

Ever since the discovery and exploitation of the Stassfurt, Germany, and Carlsbad, New Mexico, deposits, potassium chloride, called muriate of potash in the trade, has been the prime source of potassium for fertilizer use. Concentrated (62 per cent nutrient), cheap, and readily handled in bulk, it appears to be without competition. Constant improvement in mining techniques, recovery and purification methods (notably flotation procedures), and the discovery and exploitation of new deposits have placed this source of fertilizer potassium in the dominant position.

Processes for Making Mixed Fertilizers

Originally produced as a dry blend of a variety of ingredients to furnish at least two of the major plant nutrients, mixed fertilizers are today made by several liquids-solids-processing techniques. The earliest of



Distribution of costs for a conventional mixed fertilizer plant.

these procedures used a modification of the conventional batch dry-blender to permit addition of nitrogen in the form of low-cost, concentrated, and easily handled nitrogen solution (aqueous solutions of ammonium hydroxide and ammonium nitrate or urea.) Continuous processing was introduced with development of pug-mill type blenders. Improvements in design of machinery allowing the addition of liquids from pipes submerged in a moving bed of solids, such as the TVA ammoniator and the Davison-Trenton mixer, have led to increasing use of anhydrous ammonia as a nitrogen source for mixed fertilizers, permitting significant savings in raw material cost and making more concentrated mixed fertilizers possible. Introduction of this type of equipment has led to the design and construction of plants that are almost fully continuous and automatic. The design of high-speed computers that are capable of digesting market price data for all possible raw materials to produce a minimum cost formulation for a particular mixed fertilizer in a matter of minutes has furnished one more link in the chain leading to full automation of fertilizer plants.

Continuous mixed fertilzer processes in which the phosphorus is made "available" by treatment of phosphate rock with nitric acid, practiced in Europe for some time, are slowly finding acceptance in the United States. Because of the low cost of sulfur in this country, this type of process had to await improvements in nitric acid manufacture to make it attractive. Development of lower-cost nitric acid plants with improved

energy recovery may lead to wider adoption of so-called "nitric phosphate" processes for the production of concentrated, high-nitrogen mixed fertilizers.

Increasing freight costs have also prompted the development of processes for the production of diammonium phosphate from synthetic ammonia and wet-process phosphoric acid in fairly large plants designed to supply fertilizer beyond the conventional 100-200 mile radius.

Granulation, which pretty much eliminates the caking of bagged mixed fertilizer during storage, is being adopted widely to reduce handling costs, particularly of concentrated high-nitrogen fertilizers. By controlling the amount, viscosity, and surface tension of the solution phase (by control of formulation, moisture addition, and temperature), closely sized granules in the 4- to 35-mesh range are produced which, when dried, yield a free-flowing material that stands up well in storage. A by-product of this development is an increasing trend toward bulk-shipping and spreading of fertilizers as well as recent proposals for aerial fertilization of forests.

Future Trends

The path of development of any technology is shaped by the thinking and actions of many men. To predict future trends in any detail and with any assurance therefore requires omniscience, clairvoyance, and possibly a small measure of arrogance. There are certain problem areas, however, (many of which have received attention in the past) which may get increasing attention in the future.

Further efforts will undoubtedly be made to cut the cost of fertilizer in every possible way. The search for cheaper raw materials and more efficient processing and distribution methods will continue. Fertilizers will be tailored physically and chemically to give the consumer a maximum return for the dollars he spends on them. This means, among other things, continuing effort toward physical forms that minimize the consumer's handling and application costs and considerable research to tailor fertilizers chemically so that, if possible, each nutrient particle purchased ultimately shows up in the crop for which it was destined. Much has yet to be learned about soil chemistry and the effect of rates of solution to make such research fruitful.

A problem that will have to be faced some day is the extraction of fertilizer nutrients from relatively dilute or recalcitrant raw materials, using energy from some source other than conventional fuels. A possible path for nitrogen fertilizer by direct oxidation of the nitrogen in the air with the aid of nuclear energy has already been spotted. Much phosphorus and potassium, which now probably end up in the water bodies of the world, may eventually have to be recovered from these "sinks".

In fertilizer technology, just as in many other fields, there is a good chance that a dedicated search for new truths will keep putting off the dark days which Malthus, and some of his more recent followers, predicted as being just around the corner.

"As far as is known, living matter seems to conform to the general laws of physics wherever they can by tested. The motion of our limbs seems to follow the laws of mechanics like those of the parts of machines. The work we do and the heat we produce seem to be balanced by the fuel value of the raw materials in our food. Chemical reactions which can be identified in the living body proceed as they would in a test tube.

"But this is not to say that the laws of inanimate physics would be capable of giving a complete account of a living organism. It seems to be more probable that the contrary is true and that, in the living being, something manifests itself which, in our description of inanimate nature, is left out of account."

—R. E. Peierls, in
The Laws of Nature

The black "draw-down", which the technician is placing on a piece of paper, is a sample paper coating being evaluated for drying properties. The heating and cooling rolls, pictured on each side of the technician, are used in the determination of best conditions for drying so that plant coating equipment can be adjusted for best production conditions.

Coatings in the Paper Industry

Few areas of living have not been influenced by coated paper. The author discusses current coating processes in the light of materials that have recently become available, and he briefly reviews possible new areas for the expansion of the coated paper market.

by HERBERT N. JOHNSTON

THE TREMENDOUS GROWTH OF THE paper industry during the last twenty years has been due, in a very large degree, to the development and application of coating materials and technology to paper, one of the world's most widely used products. Much of this growth was brought about by the need for substitute materials during World War II. One of these substitutes, in many cases, was paper. Paper is highly acceptable because of its low cost, light weight, and ample supply.

Coated paper, although it goes unnoticed in many of its applications, influences almost everyone's daily living habits. Paper products that are taken for granted, not only from a decorative but from a functional standpoint as well, depend largely for their usefulness on the coating applied to the paper. Also, included in the broad field of paper coatings are (1) complete or partial impregnation of paper and (2) lamination of paper with plastic or metal films by use of a coating. The kitchen of any home offers an impressive testimony to the importance of coated paper. Among the examples that might be found are waxed paper, decorated shelf paper, wall paper, coated printing paper used in the publication of magazines and books, coated labels on cans and bottles, paper cups and plates, and coated paper containers used to package cereal, milk, frozen and dehydrated foods. Investigation of other specific areas of one's home, business, or hobbies will confirm the importance of coated paper in our everyday mode of life.

Purpose of Coating Paper

By varying raw materials, processes, and the use of additives, the paper manufacturer can impart many desirable qualities and properties to paper during the paper-making operations. Among the most important qualities are wet strength, color, brightness, weight, smoothness, and porosity. Moreover, by the use of various coatings, paper can be made useful and desirable for a multitude of applications for which it would be unsuitable in its uncoated form.

A listing of the properties that can be imparted to paper by various coatings helps to explain why research and development of coatings has created large, new markets for the product. Through proper selection and application of coatings, paper can be made resistant to moisture vapor, gases, grease, water, acid, alkalis, various chemicals, and abrasion. Other properties that can be imparted to coated papers are heat sealability, (for packaging operations), anti-slip qualities (helpful in stacking of containers), coating transfer (carbon paper), electrical conductivity, insulatability, flame retardancy, and photosensitivity.

The development of these added properties in paper opened many fields formerly controlled by other products, such as glass, wood, metals, and leather. For example: Coated paper is used for milk containers, which have replaced glass bottles to a large extent, for containers that have replaced some metal containers formerly used to package certain food and other products, to stimulate leather for use as book covers, and coated corrugated board is used in many applications in place of wooden containers.

Many paper coatings are strictly decorative, as for example the coatings applied to some corrugated containers. However, even these decorative coatings must exhibit fair-to-good water and scuff resistance and good permanence of color so that the package does not become unsightly during storage or use. Other large fields of application for decorative coatings are wallpaper, paper drapes, gift wraps, decorative boxes, tablecloths, and napkins. A number of these applications require the use of a combination of coatings such as a purely decorative coating and an overprint coating to protect the decorative coating. Other applications necessitate the use of coating materials that serve as both a decorative and functional coating.

Materials Used to Coat Paper

Raw materials used to produce coatings for paper include practically every known resin or binder and pigment used in the paint industry. The selection of materials for a specific application is, of course, dependent upon the properties desired, cost, and method of application. Binders used can be broken down into three general categories although some resins may be available in two or all three forms. They are, (1) solvent soluble, (2) water emulsion or water soluble, and (3) hot melts. Of these three, water-dilutable materials and hot melts are the most desirable in paper operations, since their use reduces the danger of fire during the application of the coating and eliminates the use of expensive solvents. However, in some instances, the desired properties can be obtained more readily with solvent-type materials.

Many of the raw materials used are recent developments of the chemical industry. Among these are the vinyl chloride-vinyl acetate copolymers, polyvinyl acetate, acrylics, polyethylene, polystyrene, alkyds, polyamides, the cellulosics, and various rubbers, to mention a few. Others are comparatively old materials such as asphalt, wax, starch, casein, shellac, and natural gums, which have, in some cases, been chemically modified to make them more useful.

The formulation of many coatings for paper results in the combination of several resins or raw materials to produce a coating with the desired properties. Pigments such as clay, titanium dioxide, calcium carbonate and others, are used to produce white coatings while ultramarine, siennas, various lakes and other dyes are just a few of the materials used if colored coatings are desired. Certain specialty coatings utilize powdered metals of aluminum and bronze to produce pleasing decorative effects. Additives such as defoamers, wetting agents, flow agents, fungicidal agents, and anti-blocking agents are also necessary, depending on the application and the binder.

Solvent-type materials are especially useful as heat-sealing, moisture-proof coatings and as protective coat-

The author has participated in studies relating to: organic coatings for metals; impregnation and coatings for papers for decorative and functional purposes; adhesives for paper, fabrics, and other materials; and evaluation and utilization of raw materials for coatings for paper and other materials. Prior to joining Battelle in 1952, he was a research and development chemist in the field of lacquer coatings for the Glidden Company. Johnston received his degree of Bachelor of Science in mathematics and chemistry from Ohio University. He is an active member of the American Chemical Society, the Technical Association of the Pulp and Paper Industry, and the Federation of Paint, Varnish, and Production Clubs.

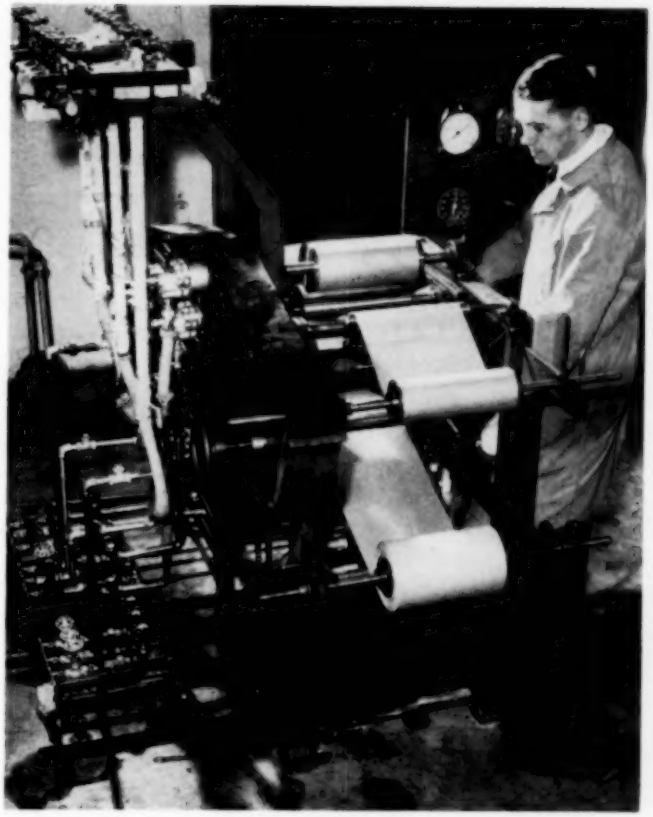
ings for labels, booklet covers, and other printed papers that must be protected. A typical heat-seal lacquer may contain nitrocellulose (the film former), a resin (for gloss and heat-sealing properties), a plasticizer, to impart flexibility to the coating, as well as a wax or other additives to prevent blocking, to make it moisture-proof, and to provide other special properties. This type of lacquer coating would be useful in the packaging of food products and other applications where a heat-seal is of great value.

A wide range of materials has become available in the water-soluble or water-emulsion category during the last ten years. Some of these materials, such as acrylics, polyethylene, and styrene-butadiene, are being used successfully where it was formerly necessary to use solvent-type materials. However, many of these emulsions, because of their higher cost in comparison with old "stand bys" such as starch, casein, and protein, are used as modifiers to improve the flexibility and waterproofness of coatings based on the lower cost materials. Typical of this type of coating material, is a base color coating for various types of paper produced in large volumes. A typical formulation might contain casein or protein, styrene-butadiene emulsion, clay, and other pigments, an alkali to dissolve the casein and an insolubilizing agent such as formaldehyde. Other additives to control flow, viscosity, foaming, and blocking may be necessary. This type of formulation illustrates the type of coating that could be used to produce wall paper, base colors for kraft or fiber board and, in general, low cost decorative coatings.

Hot-melt-type coatings for the most part have been formulated with materials that have good flow properties at elevated temperatures. Three of the most generally used materials are waxes, asphalt, and low molecular weight resins. For example: Paraffin and microcrystalline waxes are combined with polyethylene to produce a hot-melt coating with good resistance to abrasion, water, and flexing of the paper. Coatings similar to this are used to coat paper milk containers and other food packages. The formulation of carbon paper inks calls for the use of various hard waxes such as carnauba or chemically modified microcrystalline wax, blue or black pigments, clay, dyes, and various ink oils. Again many special properties, such as dye retention, transfer of coating, and ease of application are required.

Production and Application of Paper Coatings

Many large users of paper coatings develop and produce coatings for their own use. Other smaller users depend on paint and coatings manufacturers for their needs. In either case, conventional types of ball, roller, and pebble mills, and high- and low-speed mixing equipment are used.



Versatile, easily controlled equipment is an important factor in paper coating research. The coating and laminating machine in operation here has been greatly improved by installation of the system of controls shown on the left. It allows close control of the temperature of the various components used in coating operations. The machine is particularly useful to technologists in their evaluation studies of hot-melt coatings, impregnates, and laminates.

The coating of paper can be accomplished by machine and off-the-machine processes. Machine coating refers to the coating of paper directly on the paper-making machine, while off-machine coating refers to coating of the paper at a later time. This could be during the fabrication of the paper into its end-use, or a completely separate operation.

The method of application depends on the equipment available at the particular plants. Many types and variations of roller coaters are in use, designed especially for a specific job. Other methods of application are knife, brush, spray, electrostatic, and dip or immersion coating. Most of these methods can be used with a solvent water or emulsion, and hot-melt system. Frequently, heated drums and drying ovens are used as auxiliary equipment to speed the operation and to produce the desired results. Also, during the coating operation, a metal foil or plastic film may be

laminated to the paper substrate with the coating acting as an adhesive. This process has become extremely important in the field of food packaging where the laminating coating may also serve as an adhesive for heat-sealing the containers.

The Future of Coated Papers

In 1950, the Hercules Powder Company reported that the market for paper lacquers (materials which dry by solvent evaporation) had a potential in excess of that required for automobile finishes. The intervening years have indicated that the report may have been an understatement. Interest in the subject is still rising. Raw material suppliers have recognized the tremendous markets for paper coatings during the last decade and are directing research towards capturing these markets. Almost all evaluation programs of new coatings raw materials (resins and pigments in particular) now include a phase on their possible utilization in paper coatings. Paint companies are also forming special research groups directed towards the application of paint technology in the paper coatings field.

The Technical Association of the Pulp and Paper Industry has held special meetings on paper coatings for the last eight years. It has recognized the necessity of pooling and disseminating its own information, especially for the benefit of the raw material suppliers.

Unquestionably, the volume of paper coatings is increasing. This trend is directly related to the tremendous expansion of paper production that has been in progress since 1945 and that is still continuing. Increased population necessitates the use of more and more coated paper for packaging of food, appliances, and other products. Developments in the field of both the frozen-food and dehydrated-food industries have opened and will continue to open large markets for coated paper. The trend toward coated and decorated corrugated boxes is also adding volume to the market for coated paper. New methods of merchandising, such as are practiced by supermarkets, and promotion of impulse buying of packages with "eye appeal" have forced many producers to use decorative as well as functional coated paper products. More leisure time has produced greater markets for coated paper products for parties, picnics, and other leisure-time activities. The expansion of business and industry has resulted in the use of more and more carbon paper.

There are few fields and areas of living that have not been touched by coated paper. However, the development of improved and lower cost raw materials will undoubtedly open even greater markets. It is not too fantastic to think of paper clothes for those long trips where facilities for washing are limited. Coated paper boats, curtains, draperies, tents, and furniture for the camper may become reality, and perhaps even a coated paper cottage for that week away from home. These things and many others may be in the future for paper coatings.

> "For purposes of economic and social activity, the geographic environment is not the totality of physical features, but only that part of the complex (that makes up our environment) which we can conceivably use, immediately or ultimately. This effective geographic environment is determined by our skills in using it; it is, therefore, related to the development of technology. The environment is enlarged by new knowledge and new skills. The distinctive feature of human evolution lies in this fact. Human societies not only select an environment, they make their environment. The processes by which 'man makes himself' include those procedures by which man transform their environment."
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> **Abbott Payson Usher,** in
> *A History of Mechanical Inventions*

NOTES from BATTELLE

PROTECTIVE METAL COATINGS

Whenever metal coatings are being considered as protection for an underlying basis metal at high temperatures, particular attention should be paid to the nature of the interface between the coating and its base . This was one of the points emphasized by Charles L. Faust, of Battelle, speaking at the recent Symposium on Heat Tolerant Metals for Aerodynamic Applications. The symposium was sponsored by the Albuquerque, New Mexico, Chapter of the American Society for Metals.

Faust pointed out that many metals, for example molybdenum, have suitable bulk properties such as tensile and creep strength and hardness and yet will undergo surface deterioration at the temperatures reached in aerodynamic heating. (Aircraft skin temperatures may reach 600 F at speeds of 2000 mph and possibly 1600 F at 3300 mph.)

The interfacial zone between the basis metal and its protective coating can be responsible for the success or failure of the composite item. Of major importance to adherence of the coating are bond strength between the coating and the bulk basis metal, and this is dependent on the preparation of the basis metal. Preparation includes final physical and chemical cleaning and, also, the last surface finishing operations. For instance, the damaged and weakened surface caused by lathe turning of 100,000-psi steel is the Achilles heel of a composite of this steel and a coating with a 90,000 psi strength, because the weakened surface of the steel has a tensile strength of only 35,000 psi although the bulk of the steel is much stronger.

Instances will occur, says the Battelle technologist, in which a coating and a basis metal as individuals have suitable properties, but the diffusion alloy formed at the interface between them does not. In these cases, the interposition of a barrier coating with suitable diffusion characteristics can make the composite object usable. For example, chromium and nickel-chromium alloy coatings provide inadequate protection for underlying molybdenum because the "moly" diffuses through the coatings and volatilizes on contact with the oxygen in high temperature air. A chromium-gold-chromium barrier electroplate underneath the final protective coating, notes Dr. Faust, prevents the outward diffusion of the molybdenum.

RESEARCH PERSONNEL AND COSTS

Nearly 20,000 companies participated in the country's research and development effort in 1953. Of these, according to the National Science Foundation's final report on research and development during 1953-1954, about 15,500 conducted such work in their own facilities.

The study, based upon a sampling of about 11,600 companies, covers research and development costs and personnel as well as factors affecting company expenditures for research and development.

In January, 1954, the number of technical personnel employed by the surveyed companies in their activities, by categories were:

engineers	409,000	physicists	8,000
chemists	60,000	mathematicians	6,000
metallurgists	11,000	other scientsists	7,000
earth scientists	10,000	classified as administrators	34,000
agricultural, medical, and biological scientists			10,000

The average ratio of supporting workers to research and development scientists and engineers, in companies with 1000 or more employees, was 180 per 100 in 1954. The figures for supporting workers were as follows: draftsmen and other technicians, 70 per 100 scientists and engineers; skilled craftsmen, 50 per 100; and administrative, clerical, and others, 60 per 100.

The average cost of industrial research and development per scientist or engineer was $27,000, in 1953, in companies with 1000 or more employees. Among all companies, average cost ranged from $36,000 in manufacturing industries and $30,000 in aircraft and electrical equipment down to $15,000 in the rubber and food industries.

The survey showed that apparently the underlying stimulus for company-financed research and development is competition. A large proportion of the companies, however, gear their research programs and budgets to longer range plans aimed at continuing company stability or growth. In this connection, more than two-thirds of the companies reported they were conducting basic research.

While some companies reported experimentation with ratios or formulas for determining the size of their research and development budgets, more than half stated that they determined budgets on the basis of judgment of the company's needs and resources. The strongest factor stabilizing research budgets appeared to be a desire to maintain a well-established research organization. Other factors determining the level of research expenditures were:

1. Company resources, immediate needs, and aspirations for the future.
2. Nature of the firm's products and processes.
3. Management attitudes.

Almost one-fourth of the companies had developed formal methods for evaluating returns on research. The vast majority of the companies depend largely upon appraisals of the total company business, percentage of products on the market, or the number of patents granted that can be traced to the research effort.

Various factors were reported as placing limitations upon research and development. Foremost among these was the scarcity of qualified scientists and engineers. The need for additional basic research was ranked next in importance, with lack of sufficient capital to finance research in third place.

* HIGH-PURITY THORIUM RECOVERY

High-purity thorium is required in certain phases of atomic energy operations.

Studies at Battelle for the Atomic Energy Commission have shown that high-purity thorium may be recovered from monazite and concentrates after decomposing them by treatment with hot aqueous caustic soda. The insoluble residue into which the uranium, thorium, and rare earths are converted can then be dissolved in mineral acids. The thorium and uranium can be precipitated by neutralizing the solution to pH 5.5, leaving the bulk of the rare earths in solution.

The hydroxide precipitate of uranium and thorium can then be redissolved to provide a solution which makes possible the separation of uranium from thorium. The separation may be accomplished by using anion-exchange resins on sodium carbonate solutions of uranium and thorium, according to Battelle chemists R. H. Poirier, G. D. Calkins, G. A. Lutz, and A. E. Bearse who cooperated in the study. Results of this work have recently been declassified.

Preliminary work made it clear that uranium could be removed effectively from sodium carbonate solutions by the use of Amberlite IRA-400 resin. It was further proved that the adsorption of uranium was progressively more favorable as the concentration of the carbonate decreased.

The study showed that the saturation capacity of Amberlite IRA-400 for uranium, in the solution studied, was about four milligrams of UO_2 per gram of resin.

Through the use of this ion-exchange process, a thorium product containing less than one part of uranium per million parts of thorium was obtained.

* EFFICIENT HOT-CELL USE

Corrosion and heat-treatment studies of radioactive materials are frequently time consuming. As a result, they can lead to inefficient use of hot-cell space and therefore to high costs for investigations. A method of conducting varying portions of such studies outside of a hot cell has been developed by technologists at Battelle.

G. D. Calkins, . E. Whitney, and E. C. Lusk report that, based on their experience, the first step for such investigations is loading radioactive test specimens into an autoclave or furnace. The autoclave or furnace is then placed in a specially designed lead cask that serves as a radiation shield. The unit can then be safely removed to a special cubicle for the period of the corrosion testing or heat treatment, after which it is returned to the hot cell for removal and inspection of the specimens.

The cubicles used in their studies are ¼-inch-steel plate and are ventilated and the exhaust air filtered. Power and thermocouple leads from the autoclave or furnace are run out of the cubicles through closed conduits to a nonradioactive area where controller recorders are operated. Switches above each door allow shutting off of power in case of necessity. Under conditions of use described here, sufficient shielding is provided to handle specimens having activities of the order of 20,000 curies of a one-MeV gamma emitter.

* NEW BATTELLE APPOINTMENTS

Dr. Bernard H. List, chief, electrical engineering division; Howard C. Davis, chief manufacturing engineering division; Rollin J. McCrory, chief, mechanical research division; Albert M. Rockwood, chief, product development division; George Waldie, supervisor, mechanical services division; and Robert M. Conklin, assistant manager, department of mechanical engineering.

Writings by STAFF Members

Nuclear Engineering, Pt. IV, Chemical Engineering Progress Symposium Series No. 19, v. LII. American Institute of Chemical Engineers, contains the following articles by staff members:

Preparation of Dense Beryllium Oxide. Collin Hyde, J. F. Quirk, and W. H. Duckworth, pp. 105-112.

Proper calcination of a suitable starting compound appears to be the major factor in obtaining readily sinterable BeO powder. Dense BeO ceramics made from active powder had high strengths when sintered at temperatures low enough to prevent excessive crystal growth. Bend strengths decreased with increasing sintering temperatures in a manner indicating that fracture strength was inversely proportional to the average crystal diameter.

Sodium Hydroxide Pump Loops. N. E. Miller and E. M. Simons, pp. 113-116.

Describes the design and operation of small laboratory loops for investigating the influence of temperature, thermal gradient, and flow velocity on the corrosion of Ni by circulating NaOH. Low maximum temperature and small thermal cycles are required for a reasonable lifetime of a NaOH-cooled reactor.

Enameling of Zirconium. J. Schultz, H. P. Tripp, B. W. King, and W. H. Duckworth, pp. 99-104.

Enamels were developed which were adherent, free of crazes and other defects, and had low thermal-neutron-absorption cross sections. Frit compositions were based on glasses in the PbO-SiO_2 system. The enamels successfully protected the metal from oxidation when tested in air for 1000 hours at 600 C.

Transactions of American Society for Metals, vol. XLVIII, contains the following articles by staff members:

Progress in the Development of Creep-Resistant Zirconium Alloys. W. Chubb, pp. 804-824.

Alloys of the type Zr-Sn-Mo and Zr-Al-Nb are called "peritectoid-eutectoid hybrids", and are relatively easy to fabricate, exhibit good strength and ductility at room temperature, and show promise for the development of creep-resistant alloys at 500 C.

An Approach to the Study of the Effect of Rare Earth Additions to Steel by Use of Radioactive Tracer Techniques. C. S. DuMont, J. E. Gates, and C. M. Henderson, pp. 306-319.

Additions of radioactive misch metal were made to an alloy of 25 per cent Ni, 20 per cent Cr, 3.5 per cent Cu, and 2.5 per cent Mo to determine the distribution of residual misch metal constituents within the alloy. Cerium and neodymium ions were found dispersed throughout the matrix and were also slightly concentrated in the interdendritic zones of the as-cast material.

Fabrication and Evaluation of Thin Clad Sheets of Molybdenum. M. H. LaChance and R. I. Jaffee, pp. 595-626.

Techniques for producing thin sections of clad molybdenum and for edge protecting the sheared edges of the composite sheet are described. Of the cladding materials tested, molybdenum was best protected by the 80 wt. per cent Ni-20 wt. per cent Cr alloy.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Hydrogen Contamination in Descaling and Acid Pickling of Titanium. G. A. Lenning, C. M. Craighead, and R. I. Jaffee, pp. 726-741.

Significant hydrogen absorption in titanium can occur in a sodium hydride descaling bath and in a ten per cent nitric-two per cent hydrofluoric acid pickle. The amount of hydrogen absorbed increased with increasing ratio of surface area to mass and also with time in the baths. No hydrogen pickup occurred with the Virgo bath, but this treatment resulted in surface pitting.

Mechanical Properties of Ti-Cr-Mo Alloys as Affected by Grain Size and Grain Shape. H. R. Ogden, F. C. Holden, and R. I. Jaffee, pp. 627-656.

The mechanical properties of an alpha, a metastable-beta, and an alpha-beta alloy are not altered significantly by changes in grain size or grain shape. Acicular types of structures obtained by heating into the beta field prior to annealing in the alpha or alpha-beta field cause a lowering of unnotched tensile ductilities to about the same values as notched tensile ductilities. Fatigue endurance limit is unaffected by grain size or shape and appears to be relatively unaffected by alloy content.

Mescaline Analogs. V. *p*-Dialkylamino-β-Phenethylamines and 9-(β-Aminoethyl) Julolidine. F. Benington, R. D. Morin, and L. C. Clark, Jr., *Journal of Organic Chemistry*, December 1956, pp. 1470-1472.

The syntheses of several new substituted dialkylamino-β-phenethylamines having potential physiological interest are described. Biochemical studies are in progress to determine whether these substances possess mescaline-like activity.

Outdoor Durability of Tall Oil Phthalic Alkyds. R. D. Bitting, A. D. Sill, and E. R. Mueller. *Official Digest. Federation of Paint and Varnish Production Clubs*, February 1957, pp. 170-172, 173-177.

Various types of acid-refined and distilled tall oil vehicles were compared with synthetic tall oil vehicles. The data obtained show that phthalic alkyds made from both acid-refined and distilled tall oils have comparable outdoor durability if their chemical properties include per cent rosin, acid number, dimerization and viscosity of tall oil, and oil content of the alkyd.

Vapor Deposition of High-Temperature Coatings. I. E. Campbell. "Proceedings of the Symposium on 'High Temperature. A Tool for the Future' ", Stanford Research Institute, University of California, Berkeley, California, pp. 177-181.

Processes that yield coatings which are overlays and are not reacted with, or diffused into the base, and those more suitable processes that yield coatings which are diffused into the base with or without the formation of a compound phase are discussed. The vapor-plating processes are of particular interest in that they can be used to produce very refractory coatings which cannot be produced by more conventional methods on irregularly shaped objects. Details of almost 100 reactions are tabulated.

Development of Plastic Pipe Standards. H. W. Kuhlmann. *Society of Plastic Engineers Journal*, February 1957, pp. 33, 36.

The long-time stress-rupture test is the only reliable one known for determining the long-time serviceability of extruded plastic pipe. The present status of standards currently under study is outlined.

International Agreement Sought on Specifications for Gray Iron. H. W. Lownie, Jr., *Foundry*, v. 85, February 1957, pp. 120-122.

These proposed international specifications are intended to measure and define the quality and properties of the iron poured into the molds rather than the properties of the castings.

Effects of Driers on Linseed Oil and Varnish Films. Composition and Physical Characteristics of Air-Dried Films. E. R. Mueller. *Industrial and Engineering Chemistry*, February 1957, pp. 210-219.

Infrared absorption studies, chemical and weight gain data, and oxygen functional group analyses show that varnish films dried with drier gain nearly twice as much oxygen as those dried without, and linseed oil films dried without drier gain slightly more oxygen than those dried with the drier.

WORLD-WIDE ABSTRACTS

in the FIELDS of

221a AERONAUTICAL ENGINEERING
222a AGRICULTURE
225a BIOCHEMISTRY AND BIOPHYSICS
227a CERAMICS AND CONCRETE
229a CHEMICAL ENGINEERING
230a CHEMISTRY—ANALYTICAL
233a CHEMISTRY—INORGANIC AND GENERAL
234a CHEMISTRY—ORGANIC
238a CHEMISTRY—PHYSICAL
242a COATINGS
244a CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING
245a ELECTRICAL ENGINEERING
246a ELECTROCHEMISTRY
247a ELECTRONICS
250a ENGINEERING ECONOMICS
251a FLUID MECHANICS
253a FOOD TECHNOLOGY
254a FUELS AND COMBUSTION
255a GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING
257a GRAPHIC ARTS
258a HEAT POWER
258a INFORMATION—PREPARATION AND DISSEMINATION
259a INSTRUMENTATION
260a LUBRICATION AND FRICTION
260a MECHANICAL ENGINEERING
262a METALLURGY
263a METALS—CORROSION
264a METALS—EXTRACTION AND REFINING
265a METALS—FINISHING, POLISHING, AND CLEANING
265a METALS—FOUNDRY PRACTICE
266a METALS—HEAT TREATMENT
266a METALS—MECHANICAL AND PHYSICAL PROPERTIES
269a METALS—MECHANICAL WORKING
270a METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES
271a METALS—POWDER
271a NONDESTRUCTIVE TESTING AND QUALITY CONTROL
274a NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION
277a OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING
277a ORE AND MATERIALS BENEFICIATION
278a PHYSICS
279a PLASTICS
282a POLLUTION AND WASTES
282a RUBBER AND ELASTOMERS
283a SPACE HEATING AND CONDITIONING
283a TEXTILES, FIBERS, LEATHER, AND PAPER
285a WELDING AND JOINING
286a MISCELLANEOUS

BATTELLE Technical Review ABSTRACTS

April 1957 Volume 6, Number 4

***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

4788* VTOL Fixed-Wing Aircraft. Ken S. Coward. *Aeronautical Engineering Review*, v. 16, Jan. 1957, p. 35-39.

Covers tail sitters, ducted propellers, tilt wing, tilt engine, and deflected air stream types. Basic physical considerations such as development of static thrust and hovering lifting ability are considered.

4789 (English.) **On the Drag of Slender Bodies at Sonic Speed.** Sune B. Berndt. *Aeronautical Research Institute of Sweden, Report* 70, 1956, 17 p. (TL504 F67m Vis.)

Within certain limitations the drag of a body, having its cross-sectional area different from zero at the rear end, may be considerably reduced by spreading out the area in a spanwise direction leaving the distribution of cross-sectional area invariant.

4790* Design Trends in Water-Based Aircraft. John D. Pierson. *Aeronautics*, v. 35, Jan. 1957, p. 22-25.

4791 Maximum Range of a Projectile in Vacuum on a Spherical Earth. Leon Blitzer and Albert D. Wheelon. *American Journal of Physics*, v. 25, Jan. 1957, p. 21-24.

Expressions are derived in terms of the ratio of kinetic to potential energy at launch, combined with those for the corresponding launch angle, and presented graphically.

4792* (English.) **The Uses of Artificial Satellite Vehicles. I.** H. E. Canney, Jr. and F. I. Ordway, III. *Astronautica Acta*, v. 2, no. 4, 1956, p. 147-174.

Benefits of the satellite to astronomy, astrophysics, biological and medical sciences, chemical and physical research, and the geo-sciences.

4793* Ascent of Orbital Vehicles. Krafft A. Ehricke. *Astronautica Acta*, v. 2, no. 4, 1956, p. 175-190.

Types of ascent; energy requirements; thrust program and stage size; visibility; flight time.

4794* Nuclear Power for Aircraft. W. H. L. Porter. *Atomics & Nuclear Energy*, v. 8, Jan. 1957, p. 7-14.

Some considerations determining design of an aircraft propelled by nuclear power which would give the advantage of almost unlimited endurance at high speeds.

4795 New Navigation System Built Around Doppler Radar. James Holahan. *Aviation Age*, v. 27, Feb. 1957, p. 76-81.

4796* A Method of Predicting the Airborne Part of the Take-Off Distance of an Aircraft. R. B. Tamboli. *Canadian Aeronautical Journal*, v. 3, Jan. 1957, p. 10-12.

An empirical formula for the piloting technique, with its physical interpretations.

4797* Earth Satellite has Magnesium Shell. James S. Kirkpatrick. *Civil Engineering*, v. 27, Jan. 1957, p. 58-62.

Twelve objectives of the project are discussed.

4798 Capacitance Pickup Measures Small Forces. John Dimeff and Thomas B. Fryer. *Electronics*, v. 30, Feb. 1, 1957, p. 143-145.

Noncontacting arm on angle-of-attack potentiometer reduces friction to permit measurement of very small forces acting on airplane model in wind tunnel.

4799 Fatigue in Aircraft Structures. Alfred M. Freudenthal, editor. 456 p. 1956. Academic Press, New York. (TL671.6 F89f)

A compilation of papers concerning the physical theories of fatigue, prediction of fatigue life and fatigue strength, and prevention of failure.

4800 Fifth International Aeronautical Conference. Rita J. Turino, editor. 560 p. 1955. Institute of the Aeronautical Sciences, New York. (TL505 In8)

Contains 18 papers on engines and aerodynamic research for high-speed aircraft.

4801* (Russian.) Dynamics of Symmetrical Aircraft Flight. **K dinamike simmetrichnogo poleta samoleta.** L. N. Beliustina. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 11, Nov. 1956, p. 3-27.

A study of the possible movements of an aircraft in the vertical direction. Consideration of a constant angle of attack, propeller thrust, and a frontal resistance. The differential equations of the movement are qualitatively examined.

4802 Lifetimes of Artificial Satellites of the Earth. Irvin G. Henry. *Jet Propulsion*, v. 27, Jan. 1957, p. 21-24, 27.

Density of the upper atmosphere decreases roughly exponentially with altitude. Effect of this density on the lifetimes of earth satellites in elliptical and in circular orbits.

4803 Stagnation Point of a Blunt Body in Hypersonic Flow. Ting-Yi Li and Richard E. Geiger. *Journal of the Aeronautical Sciences*, v. 24, Jan. 1957, p. 25-32.

Development of a method of computing the steady symmetric inviscid flow field about a body with a blunt nose at hypersonic free-stream Mach numbers.

4804 Project Rockoon. Herbert Friedman and James E. Kupperian, Jr. *Military Electronics*, v. 2, Jan. 1957, p. 12-14, 16.

Solar radiation experiments utilize rockets launched from stratosphere balloons to overcome air-drag problem.

4805* Air Weapons Systems Analysis. Norman Precoda. *Operations Research Society of America, Journal,* v. 4, Dec. 1956, p. 684-698.

A suggested procedure for determining bomber design specifications based on the over-all performance or effectiveness of the system.

4806 Optical Aspect System for Rockets. James E. Kupperian, Jr. and Robert W. Kreplin. *Review of Scientific Instruments,* v. 28, Jan. 1957, p. 14-19.

Observations of the earth's albedo or night air glow along with observations of celestial bodies provide data from which the rocket's aspect is determined.

4807 Methods of Reducing the Transonic Drag of Swept-Back Wings at Zero Lift. D. Küchemann. *Royal Aeronautical Society, Journal,* v. 61, Jan. 1957, p. 37-42.

Reviews the physical argument behind the methods developed for reducing the normal-pressure drag of swept-back wings of moderate or large aspect ratio in the transonic flight range.

4808 On the Noise From Supersonic Jets. E. J. Richards. *Royal Aeronautical Society, Journal,* v. 61, Jan. 1957, p. 43-45.

Examines the phenomenon of resonance in choked jets with regard to the frequency of the sound emission.

4809 Generalized Aerofoil Theory. L. C. Woods. *Royal Society, Proceedings,* v. 238, ser. A, Jan. 8, 1957, p. 358-388.

Theory enables the flow of an inviscid compressible gas at subsonic speeds past a porous aerofoil, with a given pressure on the inside of the porous surface, to be calculated.

4810* Ames Light-Gas Gun. A. C. Charters. *Shell Aviation News,* no. 222, Dec. 1956, p. 12-14.

Gun using He as propellant is capable of launching a model at the same high speed as a full scale missile.

4811 The Human Pilot. *U. S. Department of Commerce, Office of Technical Services,* PB121073, Aug. 1954, 156 p. (T21 Un3r)

Fundamental aspects of the sensing and actuating processes of a human pilot; approximate methods for predicting his responses.

4812 Theory of Wing-Body Drag at Supersonic Speeds. Robert T. Jones. *U. S. National Advisory Committee for Aeronautics, Report* 1284, 1956, 7 p. (TL521 Un3r Vis.)

By adopting an approximate relation between the source strength and the geometry of a wing-body combination, the wave-drag theory is expressed in terms involving the areas intercepted by oblique planes or Mach planes.

4813 Aerodynamic Interference of Slender Wing - Tail Combinations. Alvin H. Sacks. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3725, Jan. 1957, 81 p. (TL570 Un3t)

The variations of total forces and moments with angles of attack and side slip are calculated for a number of slender plane and cruciform wing-tail combinations under the assumption that the vortex sheet is fully rolled up ahead of the tail.

4814 The Effect of Forward-Flight Speed on the Propulsive Characteristics of a Pulse-Jet Engine Mounted on a Helicopter Rotor. Robert D. Powell, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3855, Jan. 157, 23 p. (TL570 Un3t)

For a representative cruising flight speed of 90 ft. per sec. and an engine velocity of about 370 ft. per sec. a loss in propulsive thrust of about 5.5% and a 4% increase in specific fuel consumption were obtained.

4815 Wind-Tunnel Technique for Simultaneous Simulation of External Flow Field About Nacelle Inlet and Exit Air-Streams at Supersonic Speeds. Gerald W. Englert and Roger W. Luidens. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3881, Jan. 1957, 25 p. (TL570 Un3t)

4816 Effects of Wing Position and Vertical-Tail Configuration on Stability and Control Characteristics of a Jet-Powered Delta-Wing Vertically Rising Airplane Model. Powell M. Lovell, Jr. and Lysle P. Parlett. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3899, Jan. 1957, 35 p. (TL570 Un3t)

Results of a flight- and force-test investigation.

4817 A Method for Predicting Lift Increments Due to Flap Deflection at Low Angles of Attack in Incompressible Flow. John G. Lowry and Edward C. Polhamus. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3911, Jan. 1957, 29 p. (TL570 Un3t)

4818 Flight Investigation of a Roll-Stabilized Missile Configuration at Varying Angles of Attack at Mach Numbers Between 0.8 and 1.79. Jacob Zarovsky and Robert A. Gardiner. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3915, Jan. 1957, 36 p. (TL570 Un3t)

Satisfactory roll stabilization may be obtained from the combination of wing-tip ailerons and the gyro-actuated automatic-control system.

4819 Effect of Propeller Location and Flap Deflection on the Aerodynamic Characteristics of a Wing-Propeller Combination for Angles of Attack From 0° to 80°. William A. Newsom, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3917, Jan. 1957, 45 p. (TL570 Un3t)

4820 Investigation of Effectiveness of a Wing Equipped With a 50-Percent-Chord Sliding Flap, a 30-Percent-Chord Slotted Flap, and a 30-Percent-Chord Slat in Deflecting Propeller Slipstreams Downward for Vertical Take-Off. Richard E. Kuhn. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3919, Jan. 1957, 39 p. (TL570 Un3t)

4821 Boundary-Layer Transition at Mach 3.12 as Affected by Cooling and Nose Blunting. N. S. Diaconis, John R. Jack, and Richard J. Wisniewski. *U. S. National Advisory Committee* for Aeronautics, Technical Note 3928, Jan. 1957, 17 p. (TL570 Un3t)

Transition studies were made on a blunted cone-cylinder and parabolic-nosed cylinder at Reynolds numbers per ft. up to 8×10^6.

4822 Comparison of Calculated and Experimental Load Distributions on Thin Wings at High Subsonic and Sonic Speeds. John L. Crigler. *U. S. National Advisory Committee* for Aeronautics, Technical Note 3941, Jan. 1957, 46 p. (TL570 Un3t)

4823 Investigation of Variation in Base Pressure Over the Reynolds Number Range in Which Wake Transition Occurs for Nonlifting Bodies of Revolution at Mach Numbers From 1.62 to 2.62. Vernon Van Hise. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3942, Jan. 1957, 41 p. (TL570 Un3t)

4824 Instrument Flight Trials With a Helicopter Stabilized in Attitude About Each Axis Individually. Seymour Salmirs and Robert J. Tapscott. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3947, Jan. 1957, 17 p. (TL570 Un3t)

During calm-air flight, heading stabilization provided the most favorable results, with pitch stabilization and roll stabilization following. Under variable-wind conditions, pitch stabilization was most significant.

See also: **5833** (steel castings for aircraft); **6104** (heat transfer in airframes).

AGRICULTURE

4825* Selective Insecticides and the Balance of Arthropod Populations. W. E. Ripper. *Agricultural Chemicals,* v. 12, Feb. 1957, p. 36-37, 103, 105.

The high initial cost of chemicals that are selective between crop pests and beneficial insects is offset by more permanent results.

4826* Pesticide Residues on Plants. George C. Decker. *Agricultural Chemicals,* v. 12, Feb. 1957, p. 39-40, 97, 99.

Variables influencing rate of residue dissipation or loss include vapor tension, decomposition, growth rate, and erosion.

4827* 1956 Fungicide Tests. I. *Agricultural Chemicals*, v. 12, Feb. 1957, p. 51, 53, 55, 57.

Chemicals tested. Apple scab control tests in Illinois, Pennsylvania, New Hampshire, Ohio, and New York.

4828* Objective Forecasts of Cotton Yield. Walter A. Hendricks and Harold F. Huddleston. *Agricultural Economics Research*, v. 9, Jan. 1957, p. 20-25.

Forecasting procedure makes use of known fruiting characteristics of the cotton plant and permits observations obtained during the growing season to be translated into indications of final yield.

4829* Some Growth Factors Affecting the Survival of Cotton Bolls. Jack Fleischer. *Agricultural Economics Research*, v. 9, Jan. 1957, p. 26-28.

Traces the life history of cotton bolls as an aid in accurate forecasting of crop yields.

4830 How Surfaces Affect Pesticidal Dust Deposition. R. W. Brittain and W. M. Carleton. *Agricultural Engineering*, v. 37, Jan. 1957, p. 22-25, 31.

Effects of plant surface type, dust particle size, air velocity, and leaf angle on the efficiency of pesticide application.

4831* Field Plot Technique With Hybrid Corn Under Alabama Conditions. A. A. Fleming, T. Hayden Rogers, and T. A. Bancroft. *Agronomy Journal*, v. 49, Jan. 1957, p. 1-4.

Plots 1 to 3 rows wide and 10 to 15 hills long were the most efficient, disregarding relative costs.

4832* Studies in the Genetics of *Triticum Vavilovi* Jakub. H. B. Singh, Edgar Anderson, and B. P. Pal. *Agronomy Journal*, v. 49, Jan. 1957, p. 4-11.

T. vavilovi was crossed reciprocally with *T. sphaerococcum* and with three strains of *T. vulgare* to aid in determining its taxonomic status and genetic relationships.

4833* Growth, Yield, and Water Absorption of Tobacco Plants as Affected by the Composition of the Root Atmosphere. D. G. Harris and C. H. M. van Bavel. *Agronomy Journal*, v. 49, Jan. 1957, p. 11-14.

In general, plant functions were not appreciably reduced until the CO_2 concentration became greater than the O_2 concentration but were sharply reduced after the CO_2 to O_2 ratio became larger than one.

4834* The Effect of Light and Other Factors on Breaking the Dormancy of Guayule Seed. Phyllis R. Emparan and H. M. Tysdal. *Agronomy Journal*, v. 49, Jan. 1957, p. 15-19.

4835* Root Development of Winter Wheat as Influenced by Soil Moisture and Nitrogen Fertilization. H. G. Kmoch, R. E. Ramig, R. L. Fox, and F. E. Koehler. *Agronomy Journal*, v. 49, Jan. 1957, p. 20-25.

4836 Annual Review of Entomology. Edward A. Steinhaus and Ray F. Smith, editors. v. II, 407 p. 1957. Annual Reviews, Palo Alto, Calif. (QL461 An78 Vis.)

Twenty papers on metabolism, morphology, physiology, cytogenetics, insecticides, insect migration, disease transmission, pollination, and other studies.

4837* Distribution of Zinc and Copper in Seedlings of Subterranean Clover (*Trifolium Subterraneum* L.) in Solution Culture. D. S. Riceman and G. B. Jones. *Australian Journal of Agricultural Research*, v. 7, Nov. 1956, p. 495-503 + 1 plate.

4838* Investigations on Brown Rot of Apricots Caused by *Sclerotinia Fructicola* (Wint.) Rehm. I. The Occurrence of Latent Infection in Fruit. II. The Relationship of the Potassium Status of Apricot Trees to Brown Rot Susceptibility. G. C. Wade. *Australian Journal of Agricultural Research*, v. 7, Nov. 1956, p. 504-526 + 1 plate.

Infection may occur early in the fruit's development but remain latent until ripening begins. There is a negative relation between K status and susceptibility to brown rot.

4839* Definition of Potato Virus X Strains Present in New Zealand Potato Varieties. A. D. Thomson. *Australian Journal of Agricultural Research*, v. 7, Dec. 1956, p. 527-535 + 2 plates.

4840* The Effects of Some Chlorinated Hydrocarbons as Systemic Acaricides Against the Cattle Tick, *Boophilus Microplus* (Canestrini). W. J. Roulston. *Australian Journal of Agricultural Research*, v. 7, Dec. 1956, p. 608-624.

Subcutaneous injections of cattle with lindane, dieldrin, and aldrin solutions in peanut oil were markedly effective against larvae.

4841* Differential Response of Certain Varieties of Wheat to Varying Rates of Seeding. K. Das and S. C. Varma. *Banaras Hindu University, Journal of Scientific Research*, v. 6, June 1956, p. 175-180.

4842* Better Soil—Better Feed. II. Adequate Fertilization Improves Feeding Value of Forages and Sometimes Grains. W. B. Nevens and E. B. Earley. *Better Crops With Plant Food*, v. 41, Jan. 1957, p. 20-26.

4843* The Statistical Analysis of a Complex Experiment Involving Unintentional Constraints. D. J. Finney and F. W. Cope. *Biometrics*, v. 12, Dec. 1956, p. 345-368.

A factorial experiment on cacao in Trinidad presents several interesting features as an example of the design and analysis of field experiments.

4844* Theoretical and Experimental Study of Self Fertilized Populations. Theodore W. Horner and Charles R. Weber. *Biometrics*, v. 12, Dec. 1956, p. 404-414.

A formal procedure for obtaining the relationship of sample covariances and variance components to genotypic variances and covariances is derived and applied to maturity data of a soybean experiment.

4845* Status of the Gibberellins. John D. Garber. *Chemurgic Digest*, v. 15, Nov. 1956, p. 4-5.

Structure is suggested, effects are studied, and possible applications are considered.

4846* The Chemistry of Some Lesser Known Insecticides of Plant Origin. R. G. W. Spickett. *Colonial Plant and Animal Products*, v. 5, 1955, p. 288-304.

Chemistry of the naturally occurring rotenoids, especially those present in the commercially important Derris and Lonchocarpus roots, has been studied but many of the leguminous plants poisonous to fish and insects remain to be studied.

4847* Irradiation for Plant Improvement. P. T. Thomas. *Discovery*, v. 18, Jan. 1957, p. 18-20.

Proposed as a means of increasing mutation above the natural rate as well as increasing favorable mutations by selective radiation.

4848* (Russian.) Effect of Vitamins on Growth and Development of Plants. **Vliianie vitaminov na rost i razvitie rastenii.** M. Kh. Chailakhian. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 894-897.

Showed that influence of vitamins C, B, and PP on the growth and flowering of plants is not specific. Their effect was compared with the action of other chemicals.

4849* The Value of Rock Phosphates for Direct Application. G. W. Cooke. *Empire Journal of Experimental Agriculture*, v. 24, Oct. 1956, p. 295-306.

Field experiments with various types of phosphates on a number of vegetables.

4850* Herbicidal Effect of Amino Triazole. B. L. Walworth. *Farm Chemicals*, v. 120, Jan. 1957, p. 50-52.

This systemic herbicide is highly effective against hard-to-kill perennials like Canada thistle, poison ivy, quack grass, and ditch-bank water weeds.

4851 The Foliar Sorption of Iodine by Plants. A. A. Selders and F. P. Hungate. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-44890, Sept. 1956, 11 p. (UF767 Un3.1hw Contin.)

Iodine gas is taken up both by the epidermis and the mesophyll tissue of the leaf. The presence of stable I along with radioactive I did not reduce the amount of I^{131} sorption to the leaf but did reduce the amount translocated in the plant.

4852 Effect of Variations in the Acyl Moiety on Herbicidal Activity of *N*-Substituted Alpha-Chloroacetamides. P. C. Hamm and A. J. Speziale. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 30-32.

A single α-halogen atom other than F is necessary for practical herbicidal activity in the N-substituted acetamides. Extension of the acyl moiety to include halo-propionamides and butyramides results in complete inactivity under the conditions of these tests.

4853 Composition of Commercial, Segment, and Peel Juices of Florida Oranges. Lyle James Swift and M. K. Veldhuis. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 49-52.

Peel juices were always highest in pH, Brix-acid ratio, soluble pectic substances, ascorbic acid, flavonoids, diacetyl, and color, and lowest in acidity and fluorescence. They were usually highest in soluble solids, specific gravity, and viscosity.

4854* Nine Successive Thinnings in a Michigan White Pine Plantation. Stephen H. Spurr, Leigh J. Young, Burton V. Barnes, and E. L. Hughes. *Journal of Forestry*, v. 55, Jan. 1957, p. 7-13.

Comparison of data from unthinned stands and from stands thinned nine times at five yr. intervals. The latter should produce a substantially higher board-foot yield at maturity.

4855* Seasonal Effectiveness of 2,4,5-T Basal Sprays for Eradicating Ribes in White Pine Blister Rust Control in Illinois. E. D. Bergeson and Ralph W. Lorenz. *Journal of Forestry*, v. 55, Jan. 1957, p. 17-19.

4856* Progress of Heart Rot Following Fire in Bottomland Red Oaks. E. Richerd Toole and George M. Furnival. *Journal of Forestry*, v. 55, Jan. 1957, p. 20-24.

Age and size of scar, and height of butt bulge and hollow are the most practical factors to use in estimating spread of rot.

4857* Nutrient Responses of Ponderosa Pine Seedlings. J. Vlamis, H. H. Biswell, and A. M. Schultz. *Journal of Forestry*, v. 55, Jan. 1957, p. 25-27.

Comparison with lettuce and barley shows that N fertilizers alone may greatly increase growth of pine, but both N and P are essential for best growth of all three kinds of plants.

4858* Studies of Fruit Development in Relation to Plant Hormones. IV. Acidic Auxins and Growth Inhibitors in Leaves and Fruits of the Apple. L. C. Luckwill. *Journal of Horticultural Science*, v. 32, Jan. 1957, p. 18-33.

Apple leaves and fruits are shown to contain three acidic growth- promoting and two acidic growth-inhibiting substances which appear to be different from any chemically known auxins or growth inhibitors.

4859* Molybdenum as a Plant Nutrient. VIII. The Effects of Different Molybdenum Levels and Nitrogen Supplies on the Nitrogen Fractions in Cauliflower Plants Grown in Sand Culture. E. J. Hewitt, S. C. Agarwala, and A. H. Williams. *Journal of Horticultural Science*, v. 32, Jan. 1957, p. 34-48.

4860* The Effect of MCPB (Sodium 2-Methyl-4-Chlorophenoxybutyrate) on Young Red Clover (Trifolium Pratense) and Weeds. D. B. Edmond. *New Zealand Journal of Science and Technology*, v. 38, sec. A, Dec. 1956, p. 397-402.

At a rate of 1-lb. per acre MCPB does not harm red clover, but does suppress susceptible weeds.

4861* The Systemic Action of Sulphonamides Against Plant Diseases. D. Rudd Jones. *Outlook on Agriculture*, v. 1, Autumn 1956, p. 111-115.

Some of the sulfonamides readily enter plants via the roots and check infections of such obligate parasites as the cereal rusts, though not without injury to the hosts.

4862* Effect of Antibiotics and Surface-Active Agents on Bacterial Wilt of Sweet Corn in the Greenhouse. Lansing E. Williams and John L. Lockwood. *Phytopathology*, v. 47, Jan. 1957, p. 44-48.

4863* A Bacterial Disease of Clover and Velvet Beans. Walter H. Burkholder. *Phytopathology*, v. 47, Jan. 1957, p. 48-50.

A bacterial pathogen on white clover was studied in culture and identified as *Pseudomonas stizolobii*.

4864* The Control of Plastid Pigment Formation by a Virescent Gene, Pale-Yellow-1, of Maize. Robert E. Kay and Bernard O. Phinney. *Plant Physiology*, v. 31, Nov. 1956, p. 415-420.

Relationship of mutant gene to accumulation of specific carotenoid pigments and the chlorophylls.

4865* Oxidative Phosphorylation by Sweet Potato Mitochondria and Its Inhibition by Polyphenols. M. Lieberman and J. B. Biale. *Plant Physiology*, v. 31, Nov. 1956, p. 420-424.

4866* Cofactor Requirements for Oxidation of Alpha-Keto Acids by Sweet Potato Mitochondria. M. Lieberman and J. B. Biale. *Plant Physiology*, v. 31, Nov. 1956, p. 425-429.

4867* Floral Initiation in Cestrum Nocturnum, a Long-Short Day Plant. III. The Effect of Temperature Upon Long Day and Short Day Induction. Roy M. Sachs. *Plant Physiology*, v. 31, Nov. 1956, p. 430-433.

Phototemperature has the greatest effect upon long day induction and nyctotemperature has the greatest effect upon short day induction.

4868* Studies on Tobacco Alkaloids. I. Changes in Nicotine and Nornicotine Content in Nicotiana. T. C. Tso and R. N. Jeffrey. *Plant Physiology*, v. 31, Nov. 1956, p. 433-440.

4869* Utilization of Glycerol in the Tissues of the Castor Bean Seedling. Harry Beevers. *Plant Physiology*, v. 31, Nov. 1956, p. 440-445.

4870* The Fate of 2,4-Dichlorophenoxyacetic Acid in Bean Seedlings. II. Translocation. J. R. Hay and Kenneth V. Thimann. *Plant Physiology*, v. 31, Nov. 1956, p. 446-451.

2,4-D was applied in aqueous solution to a cut flap of the primary leaf of Phaseolus seedlings growing in water under controlled conditions. Uptake and movement were then followed by quantitative bioassay of partially purified ether extracts.

4871* Indoleacetic Acid and the Utilization of Radioactive Pyruvate and Acetate by Wheat Roots. Irwin B. Perlis and James F. Nance. *Plant Physiology*, v. 31, Nov. 1956, p. 451-455.

Absorption of C^{14}-labeled pyruvate and acetate is inhibited by concentrations of indoleacetic acid that inhibit root growth. Distribution of radioactivity within the tissue is also appreciably altered.

4872* The Capacity of Leaves of *Bryophyllum Calycinum* to Recover From Prolonged Exposure to Darkness or to Light. Hubert Bradford Vickery. *Plant Physiology*, v. 31, Nov. 1956, p. 455-464.

4873* The Dark Fixation of CO_2 by Succulent Leaves: the First Products. Paul Saltman, George Kunitake, Herbert Spolter, and Clyde Stitts. *Plant Physiology*, v. 31, Nov. 1956, p. 464-468.

Major products of the dark fixation of $C^{14}O_2$ by *Bryophyllum calycinum*, a typical succulent, were identified as malate and aspartate during a 6-sec. fixation period.

4874* On the Physiology of Tuber Formation in Potatoes. IV. Influence of Vitamin C on Tuber and Sprout Formation of Potatoes Aseptically Grown in the Dark. V. Influence of Vitamin B_1 on Tuber and Sprout Formation of Potatoes Aseptically Grown in the Dark. D. A. Van Schreven. *Plant and Soil*, v. 8, Dec. 1956, p. 87-103.

4875* Plant Nutrition on Fly-Ash. W. J. Rees and G. H. Sidrak. *Plant and Soil*, v. 8, Dec. 1956, p. 141-159 + 2 plates.

Chemical analysis of flyash reveals an abundance of metals in addition to normal plant requirements. However, Mn and Al appear to be available in quantities toxic to plants.

4876* A Review of Canadian Forestry Utilization Practices. J. H. Jenkins. *Pulp and Paper Magazine of Canada*, v. 58, Jan. 1957, p. 126-128.

4877* Biological Control of Pests. Some Considerations. H. E. Hinton. *Science Progress*, v. 45, Jan. 1957, p. 11-26.

A review of instances in which insects were used to control pests.

4878* Influence of Particle Size, Water Solubility, and Placement of Fertilizers on the Nutrient Value of Phosphorus in Mixed Fertilizers. K. Lawton, C. Apostolakis, R. L. Cook, and W. L. Hill. *Soil Science*, v. 82, Dec. 1956, p. 465-476.

4879* The Effect of a Dense Soil Layer and Varying Air-Water Relations on the Growth, Root Development, and Nutrient Uptake of Cotton in Commerce Silt Loam. V. C. Jamison and C. W. Domby. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 447-453.

4880* Anomalies in Capillary Intake as Explained by Capillary Rise Experiments. Dale Swartzendruber. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 453-458.

Flow in capillary tubes; Poiseuille analysis of porous materials; experiments with soil.

4881* The Effect of pH Sulfate and Phosphate Concentrations on the Adsorption of Sulfate by Soils. E. J. Kamprath, W. L. Nelson, and J. W. Fitts. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 463-466.

4882* Phosphate Supply Pattern of Various Soils. Maurice Fried and R. E. Shapiro. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 471-475.

For low phosphate-fixing soils the release pattern can be predicted by assuming a desorption type reaction. For high phosphate-fixing soils the pattern can be predicted by assuming that the system is a saturated solution of a chemical compound.

4883* Effect of Nutrition on *Trifolium hirtum* Inoculated With *Rhizobium Trifolii*. Alston W. Specht, Lewis W. Erdman, Ura Mae Means, and John W. Resnicky. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 489-495.

Symbiotic nitrogen fixation by *R. trifolii* and the growth of *T. hirtum* plants are closely dependent upon specific interrelations of Mg, K, and Ca in the nutrient supply.

4884* The Formation of Nitrate From Ammonium Nitrogen in Soils. I. Effect of Temperature. Lloyd R. Frederick. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 496-500.

Rate of nitrification increased with temperature, with the greatest increase between 7 and 15 C. A marked decrease occurred as the pH dropped below neutrality.

4885* Tests of Some Methods for Detecting Antibiotics in Soil. M. Witkamp and R. L. Starkey. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 500-504.

Chloramphenicol, penicillin, and cycloheximide could be tested by direct diffusion from soil through a cellulose film into assay agar. Antifungal antibiotics and streptomycin showed decreasing activity against certain test organisms with an increase in the amount of colloidal material in the soil.

4886* Availability of Nitrogen From Crop Residues During the First and Second Seasons After Application. H. A. Fribourg and W. V. Bartholomew. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 505-508.

The availabilities of N in alfalfa and red clover tops, soybean straw, and oat hulls were compared at different rates of application with the availability of N from NH_4NO_3.

4887* Nitrogen, a Key Factor in Fertilizer Phosphorus Efficiency. R. A. Olson and A. F. Dreier. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 509-514.

A study of the action of N in promoting fertilizer P uptake.

4888* The Application of the Mitscherlich Equation for the Calculation of Plant Composition Due to Fertilizer Increments. Monem A. Balba and Roger H. Bray. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 515-518.

4889* The Effect of Liming on the Utilization of Soil and Fertilizer Phosphorus by Several Crops Grown on Acid Organic Soils. K. Lawton and J. F. Davis. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 522-526.

4890* Crop Response to Different Soil Fertility Levels in a 5 by 5 by 5 by 2 Factorial Experiment. I. Corn. II. Peanuts. C. E. Hutton, W. K. Robertson, and W. D. Hanson. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 531-543.

Four years' data on experiments in which N, K, P, and lime were the variables.

4891* Effect of Lime Application on Nutrient Uptake by Alfalfa. F. C. Thorp and J. A. Hobbs. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 544-547.

Lime applications increased uptake of Ca, K, and P, but not Mg.

4892 The Armored Scale Insects of California. Howard L. McKenzie. *University of California Press, California Insect Survey Bulletin*, v. 5, 1956, 209 p. (SB824.C2 C12.8b Vis.)

Deals specifically with the scale insects belonging to the homopterous family Diaspididae.

See also: **5038** (analysis of pyrethrum); **5045** (analysis of insecticides); **5046** (determination of weed-control residues); **5059** (estimation of Zn in soil); **5540** (effects of insecticides on flavor); **6202** (refrigeration of citrus products).

BIOCHEMISTRY AND BIOPHYSICS

4893 Advances in Protein Chemistry. M. L. Anson, Kenneth Bailey, and John T. Edsall, editors. v. XI. 665 p. 1956. Academic Press, New York. (QD431 Ad95 Vis.)

Protein structure in relation to function and biosynthesis; growth and adrenocorticotropic hormones; column chromatography of peptides and proteins; countercurrent distribution; diffusion coefficients; complex formation between metallic cations and proteins, peptides, and amino acids.

4894 The Structure of the Antibiotic Methymycin. Carl Djerassi and John A. Zderic. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6390-6395.

Methymycin is shown to contain a twelve-membered lactone ring.

4895 Hygromycin. III. Structure Studies. Robert L. Mann and D. O. Woolf. *American Chemical Society, Journal*, v. 79, Jan. 5, 1957, p. 120-126.

Hygromycin, an antibiotic with a wide antibacterial spectrum, has been degraded to three principal units: 3,4-dihydroxy-α-methylcinnamic acid, an inosamine, and 5-keto-6-deoxy-*d*-arabohexose.

4896 Constituents of *Heliopsis* Species. V. Heliopsin, a Second Insecticidal Amide From the Roots of *H. helianthoides* var. *scabra*. Martin Jacobson. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 356-358.

4897 The Carbohydrates of Gramineae. IX. The Constitution of a Glucofructan of the Endosperm of Wheat (*Triticum vulgare*). R. Montgomery and F. Smith. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 446-450.

Glucofructan from wheat flour was investigated by methylation procedures.

4898 Central Stimulants. α,α-Disubstituted 2-Piperidinemethanols and 1,1-Disubstituted Heptahydroöxazolo (3,4-a) Pyridines. Frederick J. McCarty, Charles H. Tilford, and M. G. Van Campen, Jr. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 472-480.

A series of α,α-disubstituted-2-pyridinemethanols was prepared and converted to the corresponding 2-piperidine-methanols by hydrogenation. Heptahydroöxazolo (3,4-a) pyridine derivatives of some of the piperidinemethanols were also prepared. A number of the piperidinemethanols and heptahydroöxazolidines possess central stimulant activity.

4899 Equilibria Between Pyridoxal and Amino Acids and Their Imines. David E. Metzler. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 485-490.

Spectrophotometry of aqueous solutions of pyridoxal with amino acids shows that extensive imine formation occurs over a wide *p*H range.

4900* The Determination of Bacterial Sensitivity to Sulfaethylthiadiazole by the Filter Paper Disc Method. Russell E. Rhodes and Joyce A. McCaughan. *Antibiotics & Chemotherapy*, v. 7, Jan. 1957, p. 24-28.

4901* Some Results and Interpretations of X-Irradiation Studies With *Escherichia coli*. Charles R. Goucher, Ichiro Kamei, and W. Kocholaty. *Archives of Biochemistry and Biophysics*, v. 65, Dec. 1956, p. 522-533.

A study of the protection afforded *E. coli* B/r by incubation with succinate before exposure to irradiation; effects of malonic acid.

4902* The Nature of Surface Growth in Plant Cells. A. B. Wardrop. *Australian Journal of Botany*, v. 4, Nov. 1956, p. 193-199 + 4 plates.

Evidence for the "multi-net" type of growth in coleoptile parenchyma. In onion root cells final microfibril orientation on the outer wall surface is determined by extent and polarity of its surface growth.

4903* The Enzymic Hydrolysis of β-Glucosides. E. M. Crook and B. A. Stone. *Biochemical Journal*, v. 65, Jan. 1957, p. 1-12.

During the hydrolysis of cellobiose to gulcose by an enzyme preparation from *Aspergillus niger*, there is a transinet formation of a number of glucose oligosaccharides.

4904* The Synthesis of Some Analogues of Glutathione. *Biochemical Journal*, v. 65, Jan. 1957, p. 45-48.

4905* Studies on the Biosynthesis of Cholesterol. IV. Degradation of Rings C and D. J. W. Cornforth, Irene Youhotsky Gore, and G. Popjak. *Biochemical Journal*, v. 65, Jan. 1957, p. 94-109.

4906* The Transformation of Purines Into Pteridines. A. Albert. *Biochemical Journal*, v. 65, Jan. 1957, p. 124-127.

2-Hydroxypurine reacts with 1:2-dicarbonyl substances, such as glyoxal or glyoxylic acid, to give the corresponding pteridines in good yield.

4907* The Preparation of ^{32}P-Labelled Adenosine Polyphosphates. J. M. Lowenstein. *Biochemical Journal*, v. 65, Jan. 1957, p. 197-203.

The reaction of orthophosphate with adenosine 5′-monophosphate, diphosphate, and tri-phosphate in the presence of NN′-dicyclohexyl-carbodiimide was used.

4908* Fixation of Plant Chromosomes. Arun Kumar Sharma. *Botanical Review*, v. 22, Dec. 1956, p. 665-695.

A résumé of various fixing methods, their principles and limitations, and recent developments.

4909 A Method of Isolation of Proteins From Dilute Solutions. T. Webb, A. H. Sehon, and B. Rose. *Canadian Journal of Biochemistry and Physiology*, v. 35, Jan. 1957, p. 63-70.

Method consists of the removal of water by pervaporation and the simultaneous removal of salts and other low mol. wt. materials by dialysis.

4910 Studies on Aldosterone. I. Isolation From Adrenal Cortical Extract and a Test for Its Identity. Allan G. Gornall and Cynthia Gwilliam. **II. Hypertension as a Cumulative Effect of Aldosterone Administration.** D. Kumar, A. E. D. Hall, R. Nakashima, and A. G. Gornall. *Canadian Journal of Biochemistry and Physiology*, v. 35, Jan. 1957, p. 71-78, 113-118.

4911 Biogenesis of Alkaloids. XVIII. The Formation of Hordenine From Phenylalanine in Barley. Jacques Massicot and Léo Marion. *Canadian Journal of Chemistry*, v. 35, Jan. 1957, p. 1-4.

Phenylalanine is first converted to tyrosine, then to hordenine.

4912 Behavior and Function of Lymphocytes in Relation to Their Basic Nuclear Units. Vibeke E. Engelbert. *Canadian Journal of Zoology*, v. 34, Dec. 1956, p. 707-723 + 8 plates.

4913 Several Quinoxalines of Biological Interest. R. M. Acheson. *Chemical Society, Journal*, Dec. 1956, p. 4731-4735.

Synthesis and characteristics of some quinoxaline analogues of pteroic and pteroylglutamic acid.

4914* Tranquillisers, Ataraxics and Antidepressants. R. W. Richards. *Chemist and Druggist*, v. 167, Jan. 12, 1957, p. 43-46.

Structure, properties, and mode of action.

4915 The Structure of Insulin. F. Sanger and L. F. Smith. *Endeavour*, v. 16, Jan. 1957, p. 48-53.

Determinatin of amino-acid sequence of insulin from various animals.

4916* Quantitative Determination of Cholinesterase Activity in Individual Cells. J. Zajicek and E. Zeuthen. *Experimental Cell Research*, v. 11, Dec. 1956, p. 568-579.

A Cartesian diver method which permits quantitative determination of enzyme activity in single megakaryocytes of rat bone marrow.

4917* Automatic Pilot Plant Control in the Development of Microorganisms. George J. Fuld and Cecil G. Dunn. *Food Technology*, v. 11, Jan. 1957, p. 15-18.

Experiments with an automatic system utilizing refractive index to control sugar concentration in yeast propagation.

4918* Radioactive Labelling of Reserpine by Tritium Recoil. F. S. Rowland and Paul Numerof. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 246-248.

Radioactive reserpine was prepared with a specific activity of 225,000 dpm/mg by the recoil triton method. Approximately half of the tritium activity is located in nonlabile positions in the reserpic acid nucleus.

4919* (English.) Steroids. XV. Hypochlorus Acid Addition Reactions of Δ^5-Cholesten-3-one and Its Ethyleneketal. Susumu Mori, Ken-ichi Morita, and Fumikazu Mukawa. **XVI. Δ^4-Cholesten-6a-ol-3-One.** Ken-ichi Morita. *Japan Academy, Proceedings*, v. 32, Oct. 1956, p. 585-591.

4920* (English.) A Virus Lysing Halophilic Bacteria. Tokukiti Nozima, Saburo Iwasa, and Fujio Egami. *Japan Academy, Proceedings*, v. 32, Oct. 1956, p. 592-594.

Bacillus circulans var. Yamada 107 strain is studied.

4921* (English.) Studies on Oxidation Fermentation. XV. On the Chemical Pathway Involved in the Formation of γ-Pyrone Derivatives From Glucose by *Gluconoacetobacter Liquefaciens*. XVI. On the New Substance, Isokojic Acid, Formed From Fructose by *Gluconoacetobacter Roseum*. Kō Aida, Mitsuko Fujii, and Toshinobu Asai. *Japan Academy, Proceedings*, v. 32, Oct. 1956, p. 595-604.

4922 Factors Influencing the Production of Polyhydric Alcohols by Osmophilic Yeasts. J. F. T. Spencer, J. M. Ronburgh, and H. R. Sallans. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 64-67.

4923* The Enzymatic Transfer of Hydrogen. VI. The Reaction Catalyzed by d-Glyceraldehyde-3-Phosphate Dehydrogenase. Frank A. Loewus, H. Richard Levy, and Birgit Vennesland. *Journal of Biological Chemistry*, v. 223, Dec. 1956, p. 589-597.

Deuterium was used as tracer to show that reaction proceeds largely by way of direct transfer of H between substrate and the β-4 position of the nicotinamide ring of diphosphopyridine nucleotide.

4924* Action of Bacteriophage on Isolated Host Cell Walls. L. F. Barrington and L. M. Kozloff. *Journal of Biological Chemistry*, v. 223, Dec. 1956, p. 615-627.

4925* The Low Temperature Spectra of Hemoproteins. I. Apparatus and Its Application to a Study of Cytochrome. Ronald W. Estabrook. *Journal of Biological Chemistry*, v. 223, Dec. 1956, p. 781-794.

A method for recording spectrophotometrically the absorption bands of samples of hemoproteins cooled in liquid air. Application to study of spectral properties of reduced cytochrome c from heart muscle, yeast, and *Rhodospirillum rubrum*.

4926 Effect of Wave-Length on the Distribution of Carbon-14 in the Early Products of Photosynthesis. Theodore Cayle and Robert Emerson. *Nature*, v. 179, Jan. 12, 1957, p. 89-90.

Studies on amino-acid and phosphate-ester fractions from *Chlorella* cells.

4927* Transformations of Steroids by Molds. G. M. Shull. *New York Academy of Sciences, Transactions*, v. 19, Dec. 1956, p. 147-172.

Study of steroid transformations brought about by filamentous fungi exclusive of the actinomycetes.

4928 Physical Techniques in Biological Research. v. II. Physical Chemical Techniques. Gerald Oster and Arthur W. Pollister, editors. 502 p. 1956. Academic Press, New York. (QH324 Os7p)

Theory, apparatus, procedures, and applications of techniques such as those involving isotopes, electrophoresis and ionophoresis, X-ray diffraction, ionizing radiation, sedimentation, chromatography, magnetism, and electric potential differences.

4929 (English, French, and German.) **Proceedings of the Third International Congress of Biochemistry.** Claude Liébecq, editor. 544 p. 1956. Academic Press, New York. (QP501 In8p)

Numerous lectures, reviews, and discussions.

4930* **A Rapid Method for Determining Bactericidal Activity of Compounds Against Sulfate Reducing Bacteria.** D. G. Hitzman, L. B. Whitesill, Jr., and Ann Mills. *Producers Monthly*, v. 21, Jan. 1957, p. 28-30.

A simple bacteriological "time kill" method to determine the effectiveness and suggested concentration for field use of a large number of chemicals.

4931 Microbiological Conversions of Steroids. Durey H. Peterson. *Record of Chemical Progress*, v. 17, no. 4, 1956, p. 211-240.

A review of the varied types of chemical reactions which can be accomplished by means of the enzymes produced by microorganisms; application of these microbiological transformations to the preparation of steroid hormones.

4932 The Formation and Significance of the Porphyrins. James M. Orten. *Record of Chemical Progress*, v. 17, no. 4, 1956, p. 259-266.

A review of research relative to the structure and biosynthesis of porphyrins.

4933* **An Improved Culture Chamber for the Study of Living Bacteria.** E. O. Powell. *Royal Microscopical Society, Journal*, v. 75, ser. 3, pt. 4, 1955, p. 235-243 + 3 plates.

Embodies the principle of growth on a cellophane membrane. Organisms can be observed by vertical or transmitted illumination, with or without phase contrast, and can be stained *in situ*.

4934* **A Carbon Replica Technique for Microbiological Specimens Applied to the Study of the Division of *Saccharomyces Cerevisiae* With the Electron Microscope.** D. E. Bradley. *Royal Microscopical Society, Journal*, v. 75, ser. 3, pt. 4, 1955, p. 254-261 + 2 plates.

An adaptation to the C replica technique, which enables a surface examination to be carried out. Artifacts are even more apparent in replica studies.

4935 The Structure of the Influenza Virus. Macfarlane Burnet. *Scientific American*, v. 196, Feb. 1957, p. 37-43.

Recently developed ideas concerning virus behavior and its relation with physical and chemical characteristics.

4936* **Production of Mucopolysaccharides by Synovial Cells in a Simplified Tissue Culture Medium.** C. William Castor. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 51-56.

Human synovial tissue is capable of in vitro production of a mucopolysaccharide believed to be hyaluronic acid. Culture behavior and cellular morphology are described.

4937* **DNA Synthesis and Incorporation of P^{32} in Irradiated Ehrlich Ascites Cells.** Lola S. Kelly, J. Dorothy Hirsch, Genevieve Beach, and Nicholas L. Petrakis. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 83-86.

4938* **Adrenal Corticoid Activities of 6-Methyl-Δ-Hydrocortisone.** S. C. Lyster, L. E. Barnes, G. H. Lund, M. M. Meinzinger, and W. W. Brynes. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 159-162.

4939* **Changes in Serum Proteins During Growth of Malignant Cells *in vitro*.** H. Naim Kent and George O. Gey. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 205-208.

Electrophoretic studies revealed a significant decrease of the levels of α and β globulins of the serum nutrient during specific periods of growth.

4940* **Intermediary Metabolism of Antibiotic Resistant and Antibiotic Sensitive Staphylococci. I. Pyruvate, Glucose and Acetate.** Matthew H. Fusillo and Daniel Leigh Weiss. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 212-213.

See also: **5018** (determination of proteins); **5035** (determination of nucleic acids); **5037** (determination of C^{14} in ketoses); **5040** (structure of steroids); **5057** (determination of steroids); **5058** (determination of glutamic acids); **5145** (hydrolytic behavior of lysine derivatives); **5163** (mescaline analogs); **5520** (culture of *Chlorella* pyrenoidosa); **6182** (biological oxidation of sewage).

CERAMICS AND CONCRETE

4941* (Russian.) Moisture Absorption by Some Inorganic Building Materials. **Sorbtsionnoe uvlazhnenie nekotorykh mestnykh neorganicheskikh stroitel'nykh materialov.** L. G. Polozova. *Akademiia Nauk Estonskoi SSR, Izvestiia*, v. 5, no. 4, 1956, p. 255-266.

Sorption-desorption isotherms of concrete at a temperature of 18 ± 2 C.

4942 Contributions of Electric Melting and Boosting to Glass Technology. P. La Burthe, E. Borel, and G. de Piolenc. *American Ceramic Society Bulletin*, v. 36, Jan. 1957, p. 18-25.

Use of electric power improves rate of melting solid raw materials, increases output of furnace, reduces wear on refractories, facilitates removal of fine seeds, improves homogeneity of glass, and reduces costs.

4943 Ceramic Properties of Samarium Oxide and Gadolinium Oxide; X-Ray Studies of Other Rare-Earth Oxides and Some Compounds. C. E. Curtis and J. R. Johnson. *American Ceramic Society, Journal*, v. 40, Jan. 1957, p. 15-19.

4944* **Recent Investigations of the System Lime-Alumina-Calcium Sulfate-Water and Its Importance in Building Research Problems.** Wilhelm Eitel. *American Concrete Institute, Journal*, v. 28, Jan. 1957, p. 679-698; *ACI Proceedings*, v. 53, 1957, p. 679-698.

Review of phase equilibria; action of $CaSO_4$ solutions on setting and hardening. Action of sulfate solutions on pozzolans.

4945* **Tensile Splitting Test and High Strength Concrete Test Cylinders.** Sven Thaulow. *American Concrete Institute, Journal*, v. 28, Jan. 1957, p. 699-706; *ACI Proceedings*, v. 53, 1957, p. 699-706.

An indirect tensile test using cylindrical specimens loaded to failure in the direction of diameter. A Norwegian method for preparing specimens in which sufficient compaction of the concrete is secured, and capping for compression test is eliminated.

4946 Reactions of Cerium and Lanthanum With Ceramic Oxides. George R. Pulliam and Elmer S. Fitzsimmons. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-659, July 1955, 59 p. (UF767 Un3.1is Contin.)

Surface properties of Ce and La metals were determined for the metals melted on refractory oxide plaques of alumina, beryllia, thoria, and stabilized zirconia.

4947 Thermal Coefficient of Expansion of Concrete Aggregates. William Lerch. *ASTM Bulletin*, no. 219, Jan. 1957, p. 36-40.

Determinations by a dilatometer method.

4948* **The ζ-Potential of Kaolinite Particles.** N. Street and A. S. Buchanan. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 450-466.

A discontinuity exists in the adsorption of ions in the vicinity of pH 6.5 to 7 causing a considerable increase in the surface charge density of the particles.

4949* **The Rheology of Kaolinite Suspensions.** N. Street. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 467-479.

4950* **The Development of an Oil-Firing System for Brick Kilns. II.** H. E. Jackson. *British Clayworker*, v. 65, Jan. 1957, p. 268-273.

Advantages and disadvantages of several systems. (To be continued.)

4951* Baryta in Ceramic Whitewares. II. Ralston Russell, Jr., Camilo Valencia, and H. W. Emrich. *British Clayworker*, v. 65, Jan. 1957, p. 278-280.

A talc-clay-baryta series and the wollastonite-clay-baryta series are discussed. (To be continued.)

4952 The X-Ray and γ-Ray Absorption Coefficients of a Number of Glasses. D. A. Richardon. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 11-14.

4953 Saskatchewan's New Cement Plant. Frank M. Trasler. *Canadian Mining and Metallurgical Bulletin*, v. 50, Jan. 1957, p. 14-20.

Some details of construction, quarrying and crushing, drying and raw grinding, raw mixing and blending, burning and cooling, and clinker grinding.

4954 The Manufacture of Vitrified Grinding Wheels. H. Russell Houchins. *Ceramic Age*, v. 69, Jan. 1957, p. 12-15.

Proper selection of grain, bonding compositions, molds, and heat and kiln treatments assure the production of quality products.

4955* (Russian.) Titanium Dioxide in Glass(Phase Diagram and Properties of Titanium-Containing Glasses). **Dvuokis titana v stekle (sostav-svoistva titansoderzhashchikh stekol).** V. V. Vargin. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 848-850.

Studies the general laws between composition and properties of Ti-containing glasses, especially the system Na_2O-TiO_2-SiO_2.

4956 Flame Ceramics. Samuel W. Bradstreet. *Frontier*, v. 19, Winter 1956, p. 4-7.

Ceramic particles impinged on a molten metal substrate will adhere and form a heat resistant coating with many potential uses.

4957 Phase Separation Induced by Platinum in Sodium Phosphate Melts. G. E. Rindone and R. J. Ryder. *Glass Industry*, v. 38, Jan. 1957, p. 29-31, 51.

Phenomenon is interpreted on the basis that the sodium phosphate melt consists of at least two basically different structural groups which become unmixed in the presence of Pt particles.

4958* Control of Glass Composition Through Density Measurements. K. D. Sharma. *India, Central Glass and Ceramic Research Institute, Bulletin*, v. 3, July-Sept. 1956, p. 125-130.

Apparatus for measuring densities and testing procedure; interpretation of data.

4959 A Method for Determining the Degree of Orientation of Graphite. G. E. Bacon. *Journal of Applied Chemistry*, v. 6, Nov. 1956, p. 477-481.

Quantitative measurements of orientation by X-ray diffraction methods. Effect of nature of starting materials on orientation of the product prepared by extrusion or pressing. The "anisotropy factor" is a useful index of degree of orientation.

4960* Properties of Barium Titanium Silicate Glasses. Given W. Cleek and Edgar H. Hamilton. *Journal of Research, National Bureau of Standards*, v. 57, Dec. 1956, p. 317-323.

In the BaO-TiO_2-SiO_2 system a number of stable glasses were found which have high refractive indices, good infra-red transmittances, and high deformation temperatures, and which are unique in their resistance to attack by both acids and alkalis.

4961* (Hungarian.) The Production of Synthetic Quartz Crystals. **Megjegyzések mesterséges kvarckristályok elöállításaval kapcsolatban.** János Nagy and Imre Tarján. *Magyar Fizikai Folyoirat*, v. 4, no. 4, 1956, p. 301-307.

Investigation of the circumstances of crystal growth under varying temperature, pressure, and other experimental conditions.

4962* Glass as an Engineering Material. *Mechanical World and Engineering Record*, v. 137, Jan. 1957, p. 9-11.

Although the intrinsic ultimate tensile stress of all glasses is high, common figures taken for practical analysis are of the order of 1000 psi. only. Strength is largely independent of the type of glass, except for tempered and heat treated glasses, and working figures are largely governed by surface finish.

4963* Present Trends in Electro-Ceramics. W. R. Buessem. *Mineral Industries*, v. 26, Dec. 1956, p. 1-3.

4964 Thermal and Electrical Properties of Graphite Irradiated at Temperatures From 100 to 425 K. G. E. Deegan. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1716, Dec. 1956, 77 p. (UF767 Un3.1na Contin.)

4965 Preparation of Dense Beryllium Oxide. Collin Hyde, J. F. Quirk, and W. H. Duckworth. Paper from "Nuclear Engineering". Pt. 1V. Chemical Engineering Progress Symposium Series No. 19. v. LII. American Institute of Chemical Engineers, p. 105-112. (QC776 Am35n)

Proper calcination of a suitable starting compound appears to be the major factor in obtaining readily sinterable BeO powder. Dense BeO ceramics made from active powder had high strengths when sintered at temperatures low enough to prevent excessive crystal growth. Bend strengths decreased with increasing sintering temperatures in a manner indicating that fracture strength was inversely proportional to the average crystal diameter.

4966* Sedimentation of Thorium Oxide Slurries at Elevated Temperatures. S. A. Reed and P. R. Crowley. *Nuclear Science and Engineering*, v. 1, Dec. 1956, p. 511-521.

Observed sedimentation rates were used as a basis for calculating particle diameters and densities.

4967 Delayed Fracture of Sintered Alumina. S. Pearson. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1293-1296.

The strength of sintered alumina depends on the length of time during which the stress is applied.

4968 Hardened Concrete Pore Structure. George J. Verbeck. *Portland Cement Association Research Department Bulletin* 73, Aug. 1956, p. 136-142. (TP883 P83b Vis.)

Concrete is visualized as consisting of a heterogeneous mixture of components, each component having its own characteristic pores. Size and coarseness of voids are considered.

4969 Control of the Lime Balance in Portland Cement Clinker. L. A. Dahl. *Portland Cement Association Research Department Bulletin* 78, Oct. 1956, 11 p. (TP883 P83b Vis.)

Methods involve clinkering samples at a suitable time and temperature, and determining free lime content.

4970 Nitride-Bonded Silicon Carbide Bridges Gap Between Metals and Ceramics. W. L. Wroten. *Product Engineering*, v. 28, Feb. 1957, p. 135-139.

Shape and size factors, surface characteristics properties at elevated temperatures; application and cost data; heat, abrasion, and corrosion resistance.

4971* (English.) **Effects of Additions on Magnetic Properties of the PbO-Fe_2O_3 System.** Hiroshi Kojima. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 8, Dec. 1956, p. 540-546.

Some 12 oxide additives are evaluated.

4972* (French.) The "Vanal" Process, a New Method of Protecting Refractory Materials Against Corrosion. **Le procédé Vanal, nouveau moyen de protection contre la corrosion des matériaux réfractaires.** A. Staerker. *Silicates Industriels*, v. 21, Dec. 1956, p. 509-512.

A process for preventing high-temperature oxidation of SiC.

4973* (French.) Contribution to the Study of the Firing Time of Refractory Products. **Contribution a l'etude de la vitesse de cuisson des produits refractaires.** F. Savioli and F. Mattu. *Société Française de Céramique, Bulletin No.* 33, Oct.-Dec. 1956, p. 7-10.

A practical method for determining firing reactions in industrial bodies is shown with a method for calculating the final degree of porosity of industrial products.

4974* (French.) Synthesis of Magnetobaryte by Sintering. **Synthese de la magnetobaryte par frittage.** J. Suchet. *Société Française de Céramique Bulletin No.* 33, Oct.-Dec. 1956, p. 33-43.

Preparation of magnetobaryte ($BaFe_{12}O_{19}$) and similar substances by sintering mixtures of various oxides.

4975 Synthetic Mica Investigations. VIII. The Manufacture of Fluor-Phlogopite by the Internal Electric-Resistance Melting Process. R. A. Hatch, R. A. Humphrey, and E. C. Worden. *U. S. Bureau of Mines, Report of Investigations* 5283, Dec. 1956, 48 p. (TN21 Un3r)

4976* (French.) Thermal Evolution of the Index of Refraction of Glasses. **Évolution thermique de l'indice de réfraction des verres.** L. Prod'Homme. *Verres et Réfractaires*, v. 10, Sept.-Oct. 1956, p. 267-276.

Description of various experimental methods used, according to the quality and nature of the glass, in the study of the variation of their index from room to transformation temperatures. Results obtained with crown and flint glasses.

See also: **5253** (vaporization coefficient of graphite); **5369** (dielectric loss in various glasses); **5371** (dielectric properties of $BaO \cdot TiO_2$); **5604** (pumice concrete); **5799** (blast furnace refractories); **5829** (ceramic investment molds); **5986** (sintered high-temperature materials); **5989** (nondestructive test methods).

CHEMICAL ENGINEERING

4977 Developments in Aerosol Pressure Filling. Erwin O. Genzsch. *Aerosol Age*, v. 2, Feb. 1957, p. 30-32, 63, 65.

Filling processes in several European countries.

4978* The Changing Technology of Granulation and Ammoniation. T. P. Hignett. *Agricultural Chemicals*, v. 12, Jan. 1957, p. 30 + 6 pages.

Pilot plant data on the production of ammonium phosphate-nitrate, ammonium phosphate-urea, nitric phosphate, and granular no-nitrogen grades of fertilizer. Use of pan granulator and coarse potash.

4979* (Russian.) Dynamics of Kukersite Oil Shale Heating and Some of Its Thermo-Physical Properties. **Dinamika nagreva nekotorye teplofizicheskie svoistva slantsa-kukersita.** K. A. Kuiv. *Akademiia Nauk Estonskoi SSR, Izvestiia*, v. 5, no. 4, 1956, p. 297-307.

Determination of temperature distribution in oil shale under unsteady and steady thermal conditions. The spread of heat develops quicker in a granular bed than in a solid piece of the shale.

4980 Conductivity Method for the Control of a Soap Dryer. L. J. Okholm. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 17-21.

A method based on the measurement of the electrical conductivity of compressed soap makes possible effective control of the soap-drying process.

4981* General Aerosol Industry Notes. Robert A. Foresman, Jr. *American Perfumer and Aromatics*, v. 69, Jan. 1957, p. 56-58, 60.

Some general concepts of the industry and how to enter it. Tabulated I.C.C. regulations pertaining to aerosols.

4982* Aerosol Propellents. Winston H. Reed. *American Perfumer and Aromatics*, v. 69, Jan. 1957, p. 70-71.

Solvent and chemical characteristics; costs.

4983* Aerosol Formulations. Victor DiGiacomo. *American Perfumer and Aromatics*, v. 69, Jan. 1957, p. 72, 74, 76.

Covers foams, powders, and sprays.

4984* Effects of Pipe and Tank Lining on Water Quality at Atlanta. Paul Weir. *American Water Works Association, Journal*, v. 49, Jan. 1957, p. 1-14.

4985* Fluidised Production of Phthalic Anhydride. *British Chemical Engineering*, v. 2, Jan. 1957, p. 8-11.

Large fluidized-catalyst plants for producing a phthalic anhydride which is purer and has higher yields than fixed-bed plants.

4986* The Design of Bubble-Cap Plate Columns. T. V. Molesworth. *British Chemical Engineering*, v. 2, Jan. 1957, p. 21-26.

Simple methods are outlined for calculating the variables of bubble-cap plates to assist in design.

4987 Performance of Dry Solids Mixing Equipment. J. B. Gray. *Chemical Engineering Progress*, v. 53, Jan. 1957, p. 25J-32J.

Results of test on some common types of mixers.

4988 The Role of Nucleation in Oil-Shale Retorting. M. W. Putman. *Chemical Engineering Progress*, v. 53, Jan. 1957, p. 33J-36J.

Promotion of nucleation of oil vapor in a gas stream rising through a bed of irregularly shaped solids by seeding with NaCl or Al_2O_3 was found to simplify the later recovery of the oil by condensation.

4989 Costs of Cation Exchange Equipment. R. F. Peak and M. M. David. *Chemical Engineering Progress*, v. 53, Jan. 1957, p. 37J-40J.

A compilation of data for applications where bed sizes, shapes, and flow arrangements are important variables.

4990* Platinum Metals in the Chemical Industries. J. M. Pirie. *Chemical & Process Engineering*, v. 38, Jan. 1957, p. 11-14, 18.

Properties permit a range of uses both as a material of construction and as a catalyst.

4991* Aluminium and Its Alloys in Chemical Engineering. E. Elliott. *Chemical & Process Engineering*, v. 38, Jan. 1957, p. 19-22.

Properties; Al castings; cladding developments; new joining methods; protective finishes; chemical works structures.

4992* (German.) Economic Considerations on the Problem of the Mercury or Diphragm Process in Alkali Chloride Electrolysis. **Wirtschaftliche Überlegungen zum Problem Queck-silberoder Diaphragma-Verfahren bei der Chloralkalielektolyse.** Walter Heyder and Wilhelm Springemann. *Chemische Technik*, v. 8, Dec. 1956, p. 702-704.

A historical and technical study of alkali chloride electrolysis in relation to factors influencing industrial use.

4993* (German.) Application of the Theory of Analogy to the Mixing of Liquids. **Die Anwendung der Ähnlichkeitstheorie für die Untersuchung des Mischungseffektes von Flüssigkeiten.** Ludwig Müller. *Chemische Technik*, v. 8, Dec. 1956, p. 712-715.

Using a method of dimensional similitude, theoretical conclusions are drawn on the mixing of liquids.

4994* (English.) **Czechoslovak Fine Chemicals Standards. v. I.** 540 p. 1955. Chemapol, Prague, Czechoslovakia. (QD77 C42c)

Formulas, characteristics, technical requirements, tests, and storage recommendations.

4995* Manufacture of Pure Organic Chemicals From Chemical Pulping Wastes. Irwin A. Pearl. *Forest Products Journal*, v. 6, Dec. 1956, p. 505-507.

Separation of tall oil; developments in kraft industry; uses for lignin and other by-products.

4996 Use of Tracers in Refinery Studies. Catalyst Mixing Patterns in Commercial Cracking Units. E. Singer, D. B. Todd, and V. P. Guinn. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 11-19.

Techniques developed for tagging a cracking catalyst with radioactive isotopes, rapid injection and sampling of catalyst, and measurement of low level radioactivity.

4997 Sulfonation With Sulfur Trioxide. Petroleum Lubricant Raffinates. Everett E. Gilbert and Benjamin Veldhuis. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 31-38.

Sulfur trioxide, applied as air-diluted vapor, gives a higher yield of sulfonate and a lower yield of sludge, than oleum.

4998 New Type of Mill for Refined Chemicals. Herbert G. Tanner. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 170-173.

The spin-mill process pulverizes fine chemicals without disturbing their intrinsic properties; can fracture particles 10μ in diameter.

4999 Catalysts for Promoting Direct Esterification of Fluoroalcohols. P. D. Faurote and J. G. O'Rear. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 189-191.

Effective catalysts in order of increasing activity are H_3PO_4, *p*-toluenesulfonic-, ethanesulfonic-, and methanesulfonic acids, and H_2SO_4.

5000 Variables in Perforated Plate Column Efficiency and Pressure Drop. I. Effect of Hole Free Area, Hole Diameter, Hole Spacing, Weir Height, and Downcomer Area. C. L. Umholtz and Matthew Van Winkle. **II. Effect of Plate Thickness and System Properties.** P. D. Jones and Matthew Van Winkle. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 226-238.

5001 Preparation and Properties of Catalysts. Hillis O. Folkins and Elmer Miller. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 241-244.

Composition and physical characteristics; general methods of preparation; influence of method on activity and selectivity.

5002 Preformed Catalysts and Techniques of Tableting. Wm. D. Stillwell. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 245-249.

Procedures for tableting, calcining, and impregnating.

5003 Adsorption and Exclusion in Impregnation of Porous Catalytic Supports. R. W. Maatman and C. D. Prater. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 253-257.

After complete penetration of impregnating solution, the initial distribution of solute in the porous solid depends on its adsorption characteristics for solute or solvent molecules. It may be modified by allowing desorption and diffusion within the pore volume.

5004 Radiation Quenching, Ion Bombardment, and Annealing of Nickel and Platinum for Ethylene Hydrogenation. H. E. Farnsworth and R. F. Woodcock. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 258-260.

5005 Fluid Cracking Catalyst Contamination. I. Development of a Contaminant Test. J. J. Rothrock, E. R. Birkhimer, and L. N. Leum. **Some Fundamental Aspects of Metal Contamination.** J. E. Connor, Jr., J. J. Rothrock, E. R. Birkhimer, and L. N. Leum. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 272-282.

A test for metal contaminants in oil stocks charged to fluid catalytic cracking plants has proved useful in evaluating plant feed stocks and in studying the variables of metal contamination of catalysts.

5006 Gas Oil Cracking by Silica-Alumina Bead Catalysts. Pore Size and Particle Size Effects. Marvin F. L. Johnson, William E. Kreger, and Henry Erickson. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 283-287.

5007 Determining Drop Size Distribution of a Nozzle Spray. W. E. Ranz and Clarence Hofelt, Jr. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 288-293.

Standard test method uses the principle of inertial impaction in a special flow system to give a relative numerical measure of size distribution.

5008 Gas Phase Mass Transfer in Fixed Beds at Low Reynolds Numbers. Moshe Bar-Ilan and William Resnick. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 313-320.

Design information for a number of unit operations.

5009 A Statistical Approach to Catalyst Development. I. The Effect of Process Variables on the Vapour Phase Oxidation of Naphthalene. N. L. Franklin, P. H. Pinchbeck, and F. Popper. *Institution of Chemical Engineers, Transactions*, v. 34, no. 4, 1956, p. 280-293.

5010 Liquid Atomisation and the Drop Size of Sprays. R. P. Fraser and Paul Eisenklam. *Institution of Chemical Engineers, Transactions*, v. 34, no. 4, 1956, p. 294-319.

Survey of the fields of atomization and the major spraying applications of interest to the chemical engineer. Deals with drop size determination analysis and the influence of atomizer, design, liquid property, and ambient pressure on the drop size of a spray.

5011 Some Fundamentals of the Hypersorption Process. P. H. Calderbank and N. S. Mackrakis. *Institution of Chemical Engineers, Transactions*, v. 34, no. 4, 1956, p. 320-338.

Rates of intra-particle diffusion, gas-phase mass-transfer, and heat-transfer were evaluated and serve to explain the kinetics of the continuous countercurrent contacting of hypersorption grade activated carbon with C_2 and C_3 hydrocarbon gases. Results of contacting experiments in vertical tubes for adiabatic operation and for heat-transfer with the wall are reported.

5012* Radiotracer Studies of Flow Patterns in Industrial Plants. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 305-313.

The uniformity of flow of solid particles in a moving bed was studied to guide the design of orifice plates. Catalyst beads in continuously circulating systems in catalytic cracking plants were tracered to detect deviations from the normal flow pattern in a catalyst bed and to forecast shutdowns necessitated by immobilized portions of the bed, to measure the relative loads carried by parallel pipes in the gas-lift part of the plant, and to appraise a system of baffle plates designed to promote uniform flow in another conduit in the plant.

5013 (French.) Ion Exchange and Ion Exchangers. **L'échange d'ions et les échangeurs.** G.-V. Austerweil. 327 p. 1955. Gauthier-Villars, Paris. (TP156.I6 Au75e)

Fundamentals underlying ion exchange and exchangers. Chemistry of ion exchange, the functioning of the ion exchangers and their application to liquid treatment in general, to food liquids as wine, cider, and milk; to industrial liquids, and their use in pharmacy and medicine.

5014* (Czech.) First Run Raw Benzene, Its Composition, Determination and Analysis. **Předek surového benzolu, jeho složeni, stanoveni a rozbor.** J. Vykoukal. *Paliva*, v. 36, Dec. 1956, p. 399-403.

Apparatus and method for accurate rectification of the benzene products.

5015* New Ammonium Sulphate Plant. J. R. Clennett. *Royal Australian Chemical Institute, Proceedings*, v. 23, Dec. 1956, p. 381-387.

Some details of the H, N, ammonia, and ammonium sulfate production processes.

5016 Water Based Aerosols. Lee D. Callans and John Griswold. *Soap and Chemical Specialties*, v. 33, Jan. 1957, p. 68 + 4 pages.

Types of aerosols and their uses; market forecast.

5017* Countercurrent Steam Stripping of Co_2 From Soda-Lye Solutions. Frank J. Young and M. M. David. *Trend in Engineering (University of Washington)*, v. 9, Jan. 1957, p. 13-18.

The over-all mass-transfer coefficient based on partial pressure driving force, for the desorption of CO_2 from soda-lye solutions was approximately 0.01 lb. moles per hr. per sq. ft. atm., at 100 C. It decreases with Na normality of the lye solution.

See also: **5237** (chemical effects of γ-rays); **5334** (analog computer simulation of reactors); **5472** (aerosol economics); **5506** (sedimentation theory); **5509** (momentum transfer in fluids); **5663** (journals most cited by chemical engineers); **5733** (aerosol containers); **5987** (petroleum control laboratory); **6093** (calculation of thermal conductivity of liquids); **6176** (spent acid catalyst treatment); **6243** (distillation of hardwood); **6261** (stud welding in the chemical industry); **6293** (pressure-vessel tests).

CHEMISTRY—ANALYTICAL

5018* (English.) **A Procedure for the Determination of Proteins and Similar Compounds in Large Numbers of Fractions.** Bengt v. Hofsten. *Acta Chemica Scandinavica*, v. 10, no. 9, 1956, p. 1432-1439.

A simple procedure using a ninhydrin reaction in which a small sample from every fraction is first hydrolyzed with HCl at 120 C.

5019 Methods of Analysis for Functional Groups in Earth (Mineral) Waxes. A. Sundgren and Veikko T. Rauhala. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 7-9.

The potentiometric titration method is superior to color-indicator methods in the determination of acid and saponification values. The saponification reaction is balanced, equilibrium depending on conditions under which it is run.

5020 Determination of Rosin Acids in Mixtures With Fatty Acids. A. Linder and V. Persson. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 24-27.

Modifications in an earlier method make it faster, simpler, and less laborious.

5021 Direct Titration of Sulfate. High Precision Spectrophotometric Analysis. Max Q. Freeland and J. S. Fritz. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-667, Nov. 1955, 64 p. (UF767 Un3.1is Contin.)

5022 Spectrophotometric Determination of Chloride, Bromide, and Iodide. F. W. Chapman, Jr. and R. M. Sherwood. *Analytical Chemistry*, v. 29, Feb. 1957, p. 172-176.

The reaction products formed between chloride, bromide, or iodide and $PdSO_4$ in aqueous solution exhibit characteristic absorption spectra in the ultra-violet region.

5023 Determination of Trace Amounts of Total Nitrogen in Petroleum Distillates. G. R. Bond, Jr. and C. G. Harriz. *Analytical Chemistry*, v. 29, Feb. 1957, p. 177-180.

Nitrogen compounds may be adsorbed from large hydrocarbon samples in a small silica gel column which then is analyzed by usual Kjeldahl procedures.

5024 Fluorescent X-Ray Spectral Analysis of Powdered Solids by Matrix Dilution. E. L. Gunn. *Analytical Chemistry*, v. 29, Feb. 1957, p. 184-189.

Technique minimizes effects of elemental interaction in a generalized X-ray fluorescence analysis in which the matrix is composed of a powder sample blended with Li_2CO_3-starch carrier.

5025 Determination of Trace Amounts of Lead in Gasolines and Naphthas. Margaret E. Griffing, Adele Rozek, L. J. Snyder, and S. R. Henderson. *Analytical Chemistry*, v. 29, Feb. 1957, p. 190-195.

Two methods were developed for determinations in the concentration range of 10 to 100 parts per billion of lead as inorganic lead or tetraethyl lead. Both are modifications of dithizone colorimetric procedures and are based on the principles of pH control. A two-color spectrophotometric method is most suitable for laboratory use in analyzing simultaneously a number of samples. A one-color method involving the use of either a spectrophotometer or a color comparator is most suitable for rapid analysis of a few samples in a field or refinery situation. Both procedures employ a carbon-tetrachloride solution of bromine for decomposing and extracting tetraethyl lead from gasoline. Accuracy is within 10 parts per billion.

5026 Phosphorimetry. A New Method of Analysis. R. J. Keirs, R. D. Britt, Jr., and W. E. Wentworth. *Analytical Chemistry*, v. 29, Feb. 1957, p. 202-209.

Certain organic compounds can be determined by analysis of the phosphorescent emissions excited in the compounds under appropriate conditions. Each phosphorescence is unique in regard to its frequency, lifetime, quantum yield, and vibrational pattern, and such properties are used for qualitative identification.

5027 Coulometric Determination of Uranium(VI) at Controlled Potential. Glenn L. Booman, Wayne B. Holbrook, and James E. Rein. *Analytical Chemistry*, v. 29, Feb. 1957, p. 219-221.

Uranium(VI) can be reduced to uranium(IV) at a controlled-potential Hg cathode, by using a potassium citrate-aluminum sulfate or a H_2SO_4 electrolyte.

5028 Ferrous and Ceric Ions as Dual Intermediates in Coulometric Titrimetry. Effect of Current Density on Titration Efficiency of Electrically Generated Ceric Ions. A. James Fenton, Jr. and N. Howell Furman. *Analytical Chemistry*, v. 29, Feb. 1957, p. 221-223.

5029 Use of a Wax-Impregnated Graphite Electrode in Polarography. V. Frances Gaylor, Anne L. Conrad, and Jean H. Landerl. *Analytical Chemistry*, v. 29, Feb. 1957, p. 224-228.

Absorption of wax into the electrode pores greatly reduces the high residual currents normally found with the plain graphite rod.

5030 Determination of Vanadium in Titanium Tetrachloride and Titanium Alloys. William H. Owens, Charles L. Norton, and J. Alfred Curtis. *Analytical Chemistry*, v. 29, Feb. 1957, p. 243-245.

A rapid spectrophotometric procedure.

5031 Vacuum Fusion Determination of Oxygen and Nitrogen in Lanthanum. D. T. Peterson and D. J. Beerntsen. *Analytical Chemistry*, v. 29, Feb. 1957, p. 254-257.

5032 Analytical Applications of a Differential Thermal Analysis Apparatus. Paul D. Garn and Steward S. Flaschen. *Analytical Chemistry*, v. 29, Feb. 1957, p. 271-275.

5033 Acetylacetone as Analytical Extraction Reagent. Increase in Selectivity With (Ethylenedinitrilo) Tetraacetic Acid and Analytical Separation of Uranium From Bismuth. Anoop Krishen and Henry Freiser. *Analytical Chemistry*, v. 29, Feb. 1957, p. 288-290.

5034 Polarographic Determination of Trace Quantities of Iodide. Stanley W. Smith and John K. Taylor. *Analytical Chemistry*, v. 29, Feb. 1957, p. 301-303.

Iodide is oxidized to iodate with Br and subsequently reduced to iodide with the dropping Hg electrode.

5035* The Determination of Nucleic Acids by Their Reactions With Cysteine and Sulfuric Acid. Bohdan Bakay, Louise Kirschner, and Gerrit Toennies. *Archives of Biochemistry and Biophysics*, v. 65, Dec. 1956, p. 500-512.

Modified procedures were developed for the determination of deoxyribonucleic acid and ribonucleic acid in certain animal tissues and tissue fractions.

5036* (French.) On a New Color Reaction of Flavanols and Some of Its Applications. **Sur une nouvelle réaction colorée des flavanonols et quelques-unes de ses applications.** H. Pachéco. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1600-1604.

A method for identifying flavonols in a complex vegetable extract by means of a red color produced by acetylation in boiling acetic anhydride in the presence of anhydrous sodium acetate.

5037 A Chemical Procedure for Determination of the C^{14}-Distribution in Labelled D-Fructose and Other Ketoses. Carol Brice and A. S. Perlin. *Canadian Journal of Biochemistry and Physiology*, v. 35, Jan. 1957, p. 7-13.

5038 Chemical Aspects of Pyrethrum Analysis. II. R. G. Barradas. *Chemical Age*, v. 77, Jan. 5, 1957, p. 17-20.

Chemistry of allethrin is included.

5039 The EDTA Titration: Nature & Methods of End Point Detection. I. A. J. Barnard, Jr., W. C. Broad, and H. Flaschka. *Chemist-Analyst*, v. 45, Dec. 1956, p. 86-93, 111, 112.

Includes data on the use of *O, O*,-dihydroxyazo dyes as metal indicators for the ethylene diamine tetraacetic acid titration. (To be continued.)

5040 Applications of Infrared Spectroscopy. J. E. Page. *Chemistry & Industry*, no. 3, Jan. 19, 1957, p. 58-63.

Analysis and structure of steroids.

5041 A New Method for the Determination of Sulphate in Chromium Plating Solutions. C. J. Keattch. *Electroplating and Metal Finishing*, v. 10, Jan. 1957, p. 2-6.

The technique involves the reduction of sulphate to sulphide which is then determined volumetrically. Results are given showing the efficiency of the method in both new chromic acid solutions and used plating solutions.

5042 Spectrochemical Analysis of Cesium in High Concentrations of Sodium and Iron Salts. J. M. Taylor. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-45964, Oct. 1956, 11 p. (UF767 Un3.1hw Contin.)

Samples are mounted directly on flat-top electrodes, dried, and sparked. Standard deviation is ±2.75% and accuracy is within 10% in the range of 10 to 200 p.p.m. Ce.

5043 The Alcoholic-Iodine Method for the Extraction of Inclusions From Steel. J. E. Garside, T. E. Rooney, and J. J. Belli. *Iron and Steel Institute, Journal*, v. 185, Jan. 1957, p. 95-103.

A historical review describing the modifications evolved from the original method, and details of the apparatus. An advantage of the method is that the distribution of oxides may be determined and in addition the inclusion compounds are available for identification.

5044 Production Control Quantometer for Steelworks Analysis. D. Manterfield and W. S. Sykes. *Iron and Steel Institute, Journal*, v. 185, Jan. 1957, p. 105-113.

A direct reading spectrometer designed for the routine determination of P, Si, Mn, Ni, Cr, Sn, Cu, Mo, Al, V, Ti, Pb, and B in steels, and of SiO_2, Fe, CaO, P_2O_5, MnO, MgO, Al_2O_3, and F in slags and sinters. An entire analysis can be completed in ten minutes or less, and for both low and high alloy concentrations the results compared favorably with slower chemical methods.

5045 Use of Granulated Zinc Columns for Determining Chlorinated Organic Insecticides. Irwin Hornstein. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 37-39.

A simple procedure for the partial or complete removal of the organically bound Cl as chloride ion by the percolation of an acidified solution of the insecticide through a granulated Zn column.

5046 Residues in Crops Treated With Isopropyl N-(3-Chlorophenyl) Carbamate and Isopropyl *N*-Phenylcarbamate. Leavitt N. Gard and James L. Reynolds. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 39-41.

Analytical procedures and results of determinations on fruits and vegetables.

5047 Differential Infra-Red Spectrometry; Its Application to Analysis in the Petroleum Industry. H. Powell. *Journal of Applied Chemistry*, v. 6, Nov. 1956, p. 488-494.

A technique whereby the absorption of one or more components of a mixture may be completely eliminated from the recorded spectrum, with little, if any, loss of detail in the residual spectrum.

5048 A Rapid Method for Determining Potassium and Sodium in Coal Ash and Related Materials. P. J. Jackson and A. C. Smith. *Journal of Applied Chemistry*, v. 6, Dec. 1956, p. 547-559.

5049* The Separation and Determination of Cyclic Imino Acids. K. A. Piez, F. Irreverre, and H. L. Wolff. *Journal of Biological Chemistry*, v. 223, Dec. 1956, p. 687-697.

Colorimetric procedures.

5050* (German.) Quantitative Determination of Antioxidants. **Quantitative Bestimmung von Alterungsschutzmitteln.** J. W. H. Zijp. *Kautschuk und Gummi*, v. 10, Jan. 1957, p. 14WT-16WT.

Determination with a 2% margin of error of two antioxidants, phenyl-β-naphtalamine and diphenyl-p-phenylendiamine in vulcanized and non-vulcanized rubber mixtures.

5051 Determining Iron in Chromium Plating Solutions. Heinz W. Dettner. *Metal Finishing*, v. 55, Feb. 1957, p. 67.

A convenient method using chelating agents.

5052 The Direct Spectrophotometric Determination of Uranium in Sulfate and Carbonate Solutions. Bernard W. Wessling and Michael A. DeSesa. *National Lead Company, Inc., Raw Materials Development Laboratory (U. S. Atomic Energy Commission)*, WIN-43, June 1956, 12 p. (UF767 Un3.1wi Contin.)

5053* The Determination of Polystyrene in Oils, Alkyds, and Epoxy Resin Esters by Infrared Spectrophotometry. J. G. Fraser and A. W. Pross. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Jan. 1957, p. 75-81.

5054 Supplement No. 1 to Manual of the Analytical Methods Used by the Control Laboratory at the Chemical Processing Plant. M. J. Shepherd, Jr. and J. E. Rein. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14316 (Suppl. 1), Nov. 1956, sections individually paged. (UF767 Un3.1id Contin.)

Includes 23 new or modified analytical procedures.

5055* (English.) **Studies on Flame Spectrochemical Analysis. V. Determination of Manganese. VI. Determination of Strontium. VII. Determination of Chromium.** Shigerô Ikeda. *Science Reports of the Research Institutes, Tôhoku University*, v. 8, ser. A, Dec. 1956, p. 449-470.

5056* Volatile Acids by Direct Phosphoric Acid Distillation. James E. Frook. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 18-23.

Direct method utilizes Kjeldahl distillation apparatus, and simple technique, with recovery rates of better than 98% on all volatile acids to be expected in solution in digester sludges.

5057* Microdetermination of Acetylable Steroids in Plasma. David L. Berliner. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 126-128.

Method uses a combination of paper chromatographic and radioactive isotope techniques.

5058* Determination of L- and D-Glutamic Acids by Combined Microbiological Method and Racemization Procedure. Merrill N. Camien, Arthur Yuwiler, and Max S. Dunn. *Society for Experimental Biology and Medicine, Proceedings*, v. 94, Jan. 1957, p. 137-142.

5059* Estimation of Available Zinc in Soils From Yield-of-Zinc Curves. D. C. Nearpass. *Soil Science Society of America Proceedings*, v. 20, Oct. 1956, p. 482-488.

Native soil Zn may be estimated from yield-of-zinc curves if the total Zn supply in the aerial portions of the plants is related to the available Zn supply in a soil, and the amount of available native soil Zn is unaffected by the addition of fertilizer Zn.

5060 A Rapid Method for Fluorometric Determination of Beryllium. J. M. Riley. *U. S. Bureau of Mines, Report of Investigations* 5282, Dec. 1956, 9 p. (TN21 Un3r)

Method uses morin in an alkaline-buffered chelating solution for determining Be in ores and mill products.

5061 Analysis of Crude Shale Oil. II. Some Brazilian and U.S.A. Oils. C. S. Allbright, R. A. Van Meter, G. U. Dinneen, and J. S. Ball. *U. S. Bureau of Mines, Report of Investigations* 5286, Dec. 1956, 28 p. (TN21 Un3r)

5062 Tantalum Determination. Ross W. Moshier and James E. Schwarberg. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 56-300, June 1956, 33 p. (TL507 Un3.18w Vis.)

Studies with N-nitrosophenylhydroxylamine and N-benzoylphenylhydroxylamine for precipitation of metals lead to development of methods of separation of Mo + W from Ta, Nb, Ti, and Zr, and a method of subsequent separation of Ta from Nb, Ti, and Zr.

5063* (Russian.) The Theoretical Basis for Determining the Carbide Phase in Carbon Steel. **O teoreticheskikh osnovakh opredeleniia karbidnoi fazy v uglerodistoi stali.** Iu. A. Kliachko and O. D. Larina. *Zavodskaia Laboratoriia*, v. 22, Dec. 1956, p. 1409-1415.

Use of anodic polarization for analysis of a polyphase alloy. Effects of duration of electrolysis, temperature, and thermal treatment of samples.

5064* (German.) Photometric Determination of Iron by Means of Tri-n-Butylammonia Salt, and 7-Iodo-8-Oxychinolin-5-Sulfonic Acid. **Die photometrische Bestimmungsmethode des Eisens mit Tri-n-butylammoniumsalz und 7-Jod-8-oxychinolin-5-sulfosäure.** Max Ziegler, Oskar Glemser, and Norbert Petri. *Zeitschrift für Analytische Chemie*, v. 154, no. 3, 1957, p. 170-182.

Determination of Fe^{3+} ions from the I-Fe complex compound is possible by extraction with amyl alcohol after the addition of the tri-n-butylamine salt.

5065* (German.) Chelatometry. **Chelatometrie. XIII.** Masking of Titanium (IV) Ions. **Zur Maskierung von Titan (IV)-Ionen.** Peter Wehber. *Zeitschrift für Analytische Chemie*, v. 154, no. 3, 1957, p. 182-185.

Masking of Ti ions at pH 10 by means of ethylene-diaminetetraacetic acid.

5066* (Russian.) Iodometric Determination of Iodides. **Kvoprosu o iodometricheskom opredelenii iodidov.** B. I. Leonov. *Zhurnal Analiticheskoi Khimii*, v. 11, Nov.-Dec. 1956, p. 749-751.

Methods of iodometric determination of iodides by their oxidation to free iodine in an acid medium with a subsequent elimination of the excess of acid and bichromate by barium dioxide before titrating with thiosulfate have been developed.

See also: **4853** (analysis of citrus juices); **5014** (analysis of benzene distillates); **5076** (determination of gallic acid); **5217** (determination of hydrocarbons); **5230** (determination of hydrogen ions); **5579** (analysis of soil); **5653** (analysis of objects damaging compressor blades); **5744** (analysis of Ti); **5933** (analysis of Al alloys).

CHEMISTRY—INORGANIC AND GENERAL

5067 Disulfur Monoxide. I. Its Identification as the Major Constituent in Schenk's "Surfur Monoxide". David J. Meschi and Rollie J. Myers. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6220-6223.

The product of an electric discharge through S and SO_2 is identified as a mixture of SO_2 and disulfur monoxide, S_2O.

5068 Chemical Species Produced by Neutron Irradiation of Phosphorus Trichloride. P. K. Conn and R. E. Hein. *American Chemical Society, Journal*, v. 79, Jan. 5, 1957, p. 60-63.

Analysis of PCl_3 samples irradiated both in the gaseous and liquid phase for various time intervals and at reactor temperatures from 30 to 140 C showed 88% of the P^{32} present in the mother molecule.

5069 A New Method for the Preparation of Sodium and Calcium Nitrites. James D. Ray and Richard A. Ogg, Jr. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 265-266.

Sodium nitrite was prepared by the reaction of nitric oxide with a mixture of sodium ferrate (III) and sodium nitrate at 400° in a vacuum system. The nitrite product was at least 99.9% pure. The reaction is quantitative with respect to nitrate, but a small percentage of nitric oxide must be recycled. Calcium nitrite was similarly prepared at 275 C.

5070 The Preparation of a Strontium-Iridium Oxide Sr_2IrO_4. John J. Randall, Jr., Lewis Katz, and Roland Ward. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 266-267.

Preparation is effected by heating mixtures of Ir metal powder and Sr oxide at 1200 C in air.

5071* (French.) Thermogravimetric Study of Ortho-Boric Acid (BO_3H_3). **Étude thermogravimétrique de l'acide orthoborique BO_3H_3. I.** Dehydration Under the Influence of Heating Conditions, Fineness of the Particles and Consistency of the Dry or Damp Material. **La déshydratation, sous l'influence des facteurs allure du chauffage; degré de finesse et épaisseur de la substance; atmosphère gazeuse sèche ou humide. II.** Dehydration and Role of Steam Catalysis. **Déshydratation et rôle de la vapeur d'eau catalyse. III.** Simple Rehydration. Cyclic Dehydration-Rehydration. Measurements of Density. Rehydration simple. **Déshydratations-tehydratations cycliques. Mesures connexes de densités. IV.** Interpretation of Results and General Conclusions. **Interprétation des résultats et conclusions générales.** Jean Haladjian and Georges Carpéni. *Bulletin de la Société Chimque de France*, nos. 11-12, Nov.-Dec. 1956, p. 1689-1691.

5072 The Solubility of Uranium(IV) Hydroxide in Solutions of Sodium Hydroxide and Perchloric Acid at 25°C. K. H. Gayer and H. Leider. *Canadian Journal of Chemistry*, v. 35, Jan. 1957, p. 5-7.

5073 Observations on Ammonium Ferric Disulphate Dodecahydrate (Ammonium Ferric Alum) and Some of Its Derivatives. Henry Bassett. *Chemical Society, Journal*, Dec. 1956, p. 4705-4708.

Ammonium ferric alum effloresces to yield $NH_4Fe(SO_4)_2 \cdot 2H_2O$ or $NH_4Fe(SO_4)_2$ under dry tropical conditions. Preparation of a new basic double salt is described.

5074 Comparison of the Reducing Power of Sodium Sulfite and Hydrazine in the Steam-Water Cycle of Steam Power Plants. Frederick G. Straub. *Combustion*, v. 28, Jan. 1957, p. 34-39.

5075 The Gas Phase Reaction Between Nitric Oxide and Nitrogen Pentoxide. J. Jach. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 41-43.

Investigation of the foreign gas effect on the reaction $N_2O_5 + NO \rightarrow 3NO_2$ was conducted to the Lindemann theory of collisional activation as applied to unimolecular reactions. Under certain conditions the reaction may be treated as unimolecular with respect to the N_2O_5.

5076* Studies of Gallic Acid Complexes With Metals and Their Analytical Applications. II. A Spectrophotometric Study of Molybdenum Complexes. M. S. Varde and V. T. Athavale. **III. Spectrophotometric Estimation of Gallic Acid.** Ch. Venkateswarlu, M. Sankar Das, and V. T. Athavale. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Oct. 1956, p. 228-246.

5077 The Catalyzed Reaction Between Hydrogen and Sulphur Monochloride. M. H. Khundkar and S. Nurannabi. *Journal of Applied Chemistry*, v. 6, Dec. 1956, p. 562-568.

Effects of variables such as reaction temperature, preheating the catalyst, space velocity of S_2Cl_2 and relative ratio of H throughput.

5078 The Solvent Extraction Behavior of Inorganic Compounds. II. General Equations. III. Variation of the Distribution Quotient With Metal Ion Concentration. R. M. Diamond. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 69-81.

5079* Mellor's Comprehensive Treatise on Inorganic and Theoretical Chemistry. Suppl. II. Pt. I. F, Cl, Br, I, At. 1153 p. 1956. Longmans, Green and Co., New York. (QD31 M48c)

Preparation, characteristics, derivatives, spectroscopy, and analysis of halogen compounds, with emphasis on recent developments in fluorine chemistry and radiochemistry.

5080* Sulphur Nitride and Its Derivatives. Margot Goehring. *Quarterly Reviews*, v. 10, no. 4, 1956, p. 437-450.

A review of pertinent literature.

5081 Graphite Compounds. R. Croft. *Research*, v. 10, Jan. 1957, p. 23-28.

Trends in recent research; theory of intercalation of molecular substances in graphite; lamellar compounds of boron nitride; molecular compound formation.

5082* (Russian.) Chemical Reactions of Titanium With Other Elements. **Khimicheskoe vzaimodeistvie titana s drugimi elementami.** I. I. Kornilov and P. B. Budberg. *Uspekhi Khimii*, v. 25, Dec. 1956, p. 1474-1501.

In an effort to determine the best composition of Ti alloys, the authors examined phase diagrams of various systems. They based their examination on the arrangement of element groups in the periodic system.

5083* (Russian.) On the Disproportionation of Uranium Trichloride. **O disproportsionirovanii trikhlorida urana.** S. A. Shchukarev, I. V. Vasil'Kova, and A. I. Efimov. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2652-2656.

A method for the purification of UCl_3 by distillation in high vacuum at high temperature. The disproportion of the compound takes place with formation of metallic U.

5084* (Russian.) Investigation on Glass-Like Beryllium Fluoride. **Issledovanie kvartsepodobnogo ftoristogo berilliia.** A. N. Novoselova, O. N. Breusov, D. F. Kirkina, and Iu. P. Simanov. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2670-2675.

Thermal analysis; X-ray examination; visual determination of melting point.

5085* (Russian.) Hydrocarbonate Uranyl Compounds. **Akvokarbonatnye soedineniia uranila. I.** Synthesis of $UO_2.CO_3$ and $UO_2CO_3.H_2O$. **K sintezu $UO_2.CO_3$ i $UO_2CO_3.H_2O$. I.** I. I. Cherniaev, V. A. Golovnia, and G. V. Ellert. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2726-2735 + 1 plate.

Hydrated monocarbonate of uranyl ($UO_2.CO_3.H_2O$) was obtained from a solution of uranyl nitrate under pressure of CO_2,

and the conditions for the production of uranyl-monocarbonate ($UO_2.CO_3$) from alcoholic solutions were determined.

5086* (Russian.) Reactions in the Solid Phase With Molybdenum Trioxide. **Reaktsii v terdoi faze s uchastiem trekhokisi molibdena.** A. N. Zelikman. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2778-2791.

See also: **5663** (journals most cited by chemists); **5668** (sorption of O by Ba films).

CHEMISTRY—ORGANIC

5087* (English.) **Synthesis of Compounds Related to Muscarufin. II. 3,6-Dihydroxy-2,5-bis-(2-Carboxyphenyl)-Benzoquinone.** Martin Nilsson. *Acta Chemica Scandinavica*, v. 10, no. 9, 1956, p. 1377-1380.

3,6-Di-iodo-2,5-dimethoxybenzoquinone was converted into 3,6-di-iodo-1,2,4,5-tetramethoxybenzene, which on Ullmann coupling with methyl 2-bromobenzoate gave 2,3,5,6-tetramethoxy-1,4-bis-(2-carbomethoxyphenyl)-benzene.

5088 Kinetics of the Hydrolysis of Cyanic Acid. Alexander R. Amell. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6234-6238.

Hydrolysis rate was determined by measuring the rate of addition of standard HCl to maintain a constant *p*H. Reaction intermediates are cerbamic acid and a dimer of cyanic acid.

5089 Kinetics and Mechanism of the Gallium Bromide Catalyzed Alkylation of Aromatics With Ethyl Bromide. Charles R. Smoot and Herbert C. Brown. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6245-6249.

5090 Kinetics and Relative Rates of the Gallium Bromide Catalyzed Reactions of Alkyl Bromides With Aromatics. Charles R. Smoot and Herbert C. Brown. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6249-6254.

5091 Isomer Distribution and Partial Rate Factors in the Gallium Bromide Catalyzed Alkylation of Benzene and Toluene. The Selectivity Factor, S_t, in Electrophilic Substitution. Herbert C. Brown and Charles R. Smoot. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6255-6259.

5092 Steroid Total Synthesis—Hydrochrysene Approach. I. General Plan and Summary of Major Objectives. William S. Johnson. **II. Methoxy-8-Keto-10a Methyl-5,6,8,9,10,10a, 11,12-Octahydrochrysene.** William S. Johnson, J. Szmuszkovicz, Edgar R. Rogier, H. I. Hadler, and Hans Wynberg. **III. Reduction of the Olefinic Bonds and of the Carbonyl Group in 1-Methoxy-8-Keto-10a-Methyl-5,6,8,9,10,10a,11,12-Octahydrochrysene.** William S. Johnson, E. R. Rogier, J. Szmuszkovicz, H. I. Hadler, James Ackerman, B. K. Bhattacharyya, Barry M. Bloom, L. Stalmann, Robert A. Clement, Brian Bannister, and Hans Wynberg. **IV. 1-Methoxy-6a-Hydroxy-8-Keto - 10a - Methyl - 5,6,6a,7,8,9,10,10a,11,12 - Decahydrochrysene and Reduction Products.** William S. Johnson, James Ackerman, Jerome F. Eastham, and H. A. DeWalt, Jr. **V. Introduction of Oxygen at the 11-Position.** William S. Johnson, A. D. Kemp, Raphael Pappo, James Ackerman, and William F. Johns. **VI. Catalytic Hydrogenation of the Aromatic Nucleus. Synthesis of *dl*-3β-Acetoxy-14-*iso*-Etioallohomobilianic Acid.** William S. Johnson, E. R. Rogier, and James Ackerman. **VII. Metal-in-Ammonia Reduction of the Aromatic Nucleus. *dl*-Epiandrosterone and the Lumi Epimer.** William S. Johnson, Brian Bannister, and Raphael Pappo. **VIII. *dl*-3β,11β-Dihydroxyandrostane-17-One.** William S. Johnson, Raphael Pappo, and William F. Johns. **IX. Preparation of Comparison Substances by Partial Synthesis.** Raphael Pappo, Barry M. Bloom, and William S. Johnson. **X. Total Synthesis of Testosterone.** William S. Johnson, Brian Bannister, Raphael Pappo, and J. E. Pike. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6278-6361.

5093 Reactions of Triethylgermanium Hydride With Salts of Transitional Elements and With Organic Haloacids. Herbert H. Anderson. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 326-328.

Triethylgermanium hydride reduces salts of certain transitional elements either to a lower oxidation state or sometimes to the free metal. These reductions apparently occur with transitional elements in which the oxidation potential for the highest oxidation state present, such as Ti(III) to Ti(IV) has a value of −0.06 v. or less; as expected, no reduction of $CdCl_2$ occurs.

5094 A Kinetic Investigation of the Acid-Catalyzed Rearrangement of Benzhydryl Azides and 1,1-Diarylethyl Azides. Cathryn H. Gudmundsen and William E. McEwen. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 329-334.

5095 Reactions of 1-Heptafluoropropylmagnesium Bromide. II. The Synthesis of Fluorine-Containing Olefins and of 1-Heptafluoropropylbenzene. E. T. McBee, C. W. Roberts, and A. F. Meiners. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 335-337.

New synthesis of (perfluoroalkyl)-benzenes has been developed by the use of perfluoroalkyl Grignard reagents.

5096 The Synthesis of Alkylhaloboranes. V. W. Buls, O. L. Davis, and R. I. Thomas. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 337-339.

Alkylchloroboranes and alkylfluoroboranes were prepared by a high temperature reaction of a trialkylborane with the appropriate thihaloborane.

5097 The Preparation of Some Derivatives of Phenoxasilin, a Silicon Analog of Xanthene. Katashi Oita and Henry Gilman. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 339-342.

5098 The Reactions of Triphenylgermyllithium, Triphenylgermylpotassium and Triphenylgermane With Some Olefins. Henry Gilman and Clare W. Gerow. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 342-345.

5099 Allylic Chlorides. XXIII. The 1-Chloro-2-Methyl-2-Butenes. Lewis F. Hatch and Paul R. Noyes. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 345-348.

Preparation of *cis*- and *trans*-1-chloro-2-methyl-2-butene and determination of their infra-red spectra and physical properties. Their relative reactivities with sodium ethoxide in ethanol and potassium iodide in acetone were determined.

5100 Stereochemistry of Allylic Rearrangements. VIII. The Acid-Catalyzed Rearrangement of *cis*- and *trans*-5-Methyl-2-Cyclohexenol in Aqueous Acetone. Harlan L. Goering and Ernest F. Silversmith. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 348-352.

5101 Reactions of the Cycloheptatrienylium (Tropylium) Ion. W. von E. Doering and L. H. Knox. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 352-356.

The tropylium ion reacts as an electrophilic reagent with water, hydrogen sulfide and ammonia to give ditropyl ether, sulfide, and amine, respectively; with acetamide benzamide and succinimide to form the N-tropyl derivatives; and with cyanide ion to give tropyl cyanide which can be hydrolyzed to an amide identical with Buchner's norcaradiene carboxamide and which reacts with phenylmagnesium bromide to give desoxybenzoin.

5102 Organic Sulfur Derivatives. I. Addition of Mercaptoacetic Acid to Long-Chain Monounsaturated Compounds. N. H. Koenig and Daniel Swern. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 362-365.

Sulfides are formed by the free-radical addition of mercaptoacetic acid to oleic acid, methyl oleate, methyl ricinoleate or 10-undecenoic acid. Diesters were prepared by esterifying the product from oleic acid, 9 (10)-(carboxymethylthio)-stearic acid, and by treating *n*-butyl oleate with ethyl mercaptoacetate.

5103 Base-Induced Rearrangements. Action of Iodide Ion on Certain 1,3-Dihalides. W. M. Schubert and Sideney M. Leahy, Jr. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 381-385.

Eight 1,3-dihalides were treated with sodium iodide in dimethylformamide or acetamide at temperatures ranging from 120 to 170 C. Six of these dihalides showed the rearrangement-elimination reactions giving moderate yields of olefins.

5104 The Preparation and Properties of Some Higher Aliphatic *t*-Hydroperoxides. Robert W. Foreman and Herman P. Lankelma. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 409-411.

5105 Reaction of β-Pinene With Dienophiles. Richard T. Arnold and John S. Showell. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 419-422.

β-Pinene was found to react at 140 C with a series of dienophiles including maleic anhydride, dimethyl maleate, dimethyl fumarate, and methylenemalonic ester to form 1-1 adducts.

5106 Phosphorylated Sugars. II. The Preparation of the Anomeric Methyl 5-O-Benzyl-D-Ribofuranoside 2,3-Cyclic Carbonates and the Study of Their Reactions With Hydrogen Bromide in Acetic Acid. G. M. Tener and H. G. Khorana. **III. Syntheses of α-D-Ribofuranose 1-Phosphate.** G. M. Tener, R. S. Wright, and H. G. Khorana. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 437-443.

5107 Oximes of the Pyridine Series. Sara Ginsburg and Irwin B. Wilson. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 481-485.

A number of oximes containing the pyridine and quaternary pyridine nucleus are described. The tertiary oximes have the *syn* configuration, but it appears that both isomers can in general be obtained in the quaternary series. One isomer is unstable and readily converts to the other.

5108 Potential Purine Antagonists. IV. Synthesis of Some 9-Methyl-6-Substituted-Purines. Roland K. Robins and Hsi Hu Lin. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 490-494.

5109 Radioactive Tetracycline. Torsten André and Sven Ullberg. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 494-495.

A method for preparation of tritium-labeled tetracycline of high specific activity is described. The H^3-tetracycline is produced by catalytic hydrogenation of chlorotetracycline with tritium gas.

5110 The Stereospecific Synthesis of *dl*-Alloyohimbane and dl-3-Epialloyohimbane. Gilbert Stork and Richard K. Hill. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 495-500.

A general method for the stereospecific synthesis of the alloyohimbane skeleton is described. This has led to the first synthesis of the pentacyclic ring system present in reserpine. The stereochemistry of the two alloyohimbanes is established.

5111* Recent Advances in the Field of Acid and Substantive Anthraquinone Dyestuffs. J. Gunthard. *American Dyestuff Reporter*, v. 46, Jan. 14, 1957, p. 9-21.

Structural configurations for 149 dyestuffs. The lines of development followed in order to meet desired standards of shade, fastness to milling, and level dyeing.

5112 The Kinetics of the Hydrogenation of Pure Fatty Esters. III. Poly-Olefinic Systems; Selectivity of Raney Nickel. Franz A. Vandenheuvel. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 12-15.

5113 Synthetic Detergents From Animal Fats. VIII. The Ethenoxylation of Fatty Acids and Alcohols. A. N. Wrigley, F. D. Smith, and A. J. Stirton. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 39-43.

Data on solubility, cloud point, surface and interfacial tension, detergency, and wetting, foaming and emulsifying properties.

5114 Interaction Studies of Cationic Drugs With Anionic Polyelectrolytes. II. Polyacrylic and Styrene Polymers. Lloyd Kennon and Takeru Higuchi. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 46, Jan. 1957, p. 21-27.

Studies with sodium polyacrylate, a styrene-maleic anhydride polymer, and a styrene-chloromaleic anhydride polymer indicate that binding takes place by coacervation of oppositely charged ions, additional intermolecular force phenomena, and/or by replacement of bound Na by organic cations.

5115* (German.) Organic Catalysts. **Über organische Katalysatoren. XLI.** Catalytic Properties of o-Quinones. **Katalytische wirkungen von o-chinonen.** Horst Pracejus. *Annalen der Chemie*, v. 601, Dec. 1956, p. 61-81.

Among other syntheses that of 1-iodo-3-methoxy-4-acetamino-2-naphthoic acid methylester is given. However, the action of Cu on this compound did not result in formation of dinaphthyl derivative. Preparation of 1-iodo-3-methoxy-4-phthalimido-2-naphthoic acid methyl esters is described.

5116* (German.) Vinylation. **Vinylierung.** Walter Reppe. *Annalen der Chemie*, v. 601, Dec. 1956, p. 81-138.

Vinylethers and vinylesters; S-containing vinyl compounds, vinyl nitrogen compounds and their reactions. Several hundred compounds are prepared from acetylene.

5117* Studies in the Chemistry of Phenothiazine. II. Dichlorophenothiazines, and Some Observations on the Herz Reaction and the Smiles Rearrangement. K. J. Farrington and W. K. Warburton. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 480-488.

5118* The Structure of Cryptopleurine and Hofmann Degradation of Some Quinolizidine Alkaloids. E. Gellert. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 489-496.

5119* Synthesis of Long-Chain Hydroxy Ketones From Hydroxy Acids. J. A. Lamberton. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 528-532.

The acyl chlorides derived from *threo*- and *erythro*-dihydroxystearic acid and -dihydroxybehenic acid, in which the alcohol groups are unreactive, are converted into ketene dimers by reaction with triethylamine and thence to long-chain tetrahydroxy ketones.

5120* Absorption of Carbon Dioxide in Solutions of Diethanolamine. D. R. Morris and S. B. Watkins. *British Chemical Engineering*, v. 2, Jan. 1957, p. 16-20.

Rates were measured using the standard disc-column. (To be continued.)

5121 Reactions of Organic Peroxides. VIII. 1:3:3-Trimethylindan-1-yl Hydroperoxide and Its Conversion Into 2:4:4-Trimethylchroman Derivatives. William Webster and Donald P. Young. *Chemical Society, Journal*, Dec. 1956, p. 4785-4791.

5122 The Chemistry of Petrochemicals. Melvin J. Astle. 267 p. 1956. Reinhold Publishing Corp., New York. (TP699 As85c)

A systematic, highly readable survey of the petrochemical industry, giving the preparation and important chemical reactions of industrial chemicals made directly or indirectly from petroleum hydrocarbons.

5123* Waxes and Wax-Like Materials. George W. LeMaire. *Colorado School of Mines, Quarterly*, v. 52, Jan. 1957, 70 p.

Review of science and technology pertaining to the manufacture of wax and wax products; results of research problems involving wax.

5124* (Spanish.) The Reactions of Propylene With Mercury Salts. **Reacciones del propileno con sales mercuricas.** J. L. Martinez Cordon and Vicente Gomez Aranda. *Combustibles*, v. 26, July-Aug. 1956, p. 214-234.

Studies of the behavior of olefin hydrocarbons in the presence of Hg salts.

5125* (Russian.) The Dual Reacting Capacity in the Interaction of Olefins With Aldehydes. **Dvoistvennaia reaktsionnaia sposobnost' pri vzaimodeistvii olefinov s al'degidami.** M. I. Farberov. *Doklady Akademii Nauk SSSR*, v. 110, Oct. 21, 1956, p. 1005-1008.

The reactions of olefins with formaldehydes, aldehydes and other anhydrides in aqueous liquid in the presence of an acid were studied in a series of compounds. Diols, some products of further interaction of diols with aldehydes, and cyclical acetate-alkydioxane 1-3 were obtained.

5126* (Russian.) Synthesis of Dienes With Fixed Trans Configuration of Double Bonds. 3-Methylenecyclohexane. **Sintez dienov s zakreplennoi transoidnoi konfiguratsiei dvoinykh sviazei. 3-Metilentsiklogeksan.** I. N. Nazarov and N. V. Kusnetsov. *Doklady Akademii Nauk SSSR*, v. 111, Nov. 11, 1956, p. 358-361.

Data on synthesis of 3-acetoxymethyl-cyclohexane; pyrolysis of acetate; preparation and hydration of oxime; methylation of diamine; preparation of 3-methylenecyclohexane, and its ozonization.

5127* (Russian.) On the Addition of Bromine to Alkenylacetylenes. **O poriadke prisoedineniia broma k alkenilatsetilenam.** A. A. Petrov and Iu. I. Porfir'eva. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 839-841.

Two hydrocarbons, propenyl- and butenyl-acetylene, were produced and added to Br in a 1:1 ratio. Chemical properties and infra-red spectra of the resulting dibromides were determined.

5128 Heterocyclic Compounds. v. V. Five-Membered Heterocycles Containing Two Hetero Atoms and Their Benzo Derivations. Robert C. Elderfield, editor. 744 p. 1957. John Wiley & Sons, New York. (QD400 EL22h)

Treats the 1,3-dioxolanes and their benzo derivatives but not their S analogs; the oxazoles and thiazoles are covered. German and English literature is reviewed through 1955.

5129 Dealkylation of Ethylbenzene. Maxwell Nager. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 39-41.

Conditions for cracking ethylbenzene to produce lower aromatics without degrading xylene.

5130 Preparation and Rate of Hydrolysis of Boric Acid Esters. Howard Steinberg and D. L. Hunter. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 174-181.

Synthesis of boric acid esters from 38 primary, secondary, and tertiary alcohols, glycols, and phenols; determination of their rates of hydrolysis in water and aqueous dioxane.

5131 Refining Low Temperature Tar Acids With Ion Exchange Resins. E. A. Depp and M. B. Neuworth. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 182-185.

Ion exchange purification of solvent-extracted tar acids with strong base and strong acid resins produces tar acids of high purity by removal of butyric acid and tar bases.

5132 Isolation of Diosgenin by Acid Hydrolysis of Saponin. J. W. Rothrock, P. A. Hammes, and W. J. McAleer. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 186-188.

Elimination of organic solvents in the initial extraction, and utilization of hydrocarbon solvents with high selectivity for sapogenin. Process is simpler, less expensive, and more adaptable to large scale operations than classical processes.

5133 Hydrolysis of Acetic Anhydride in Concentrated Acetic Acid Without Catalysis. H. J. Janssen, C. H. Haydel, and L. H. Greathouse. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 197-201.

Thermometric techniques provide accurate information on hydrolysis rate.

5134 Use of Hydrazine as a Reducing Agent for Unsaturated Compounds. II. The Hydrogenation of Elaidic and Ricinoleic Acids. F. Aylward and C. V. Narayana Rao. *Journal of Applied Chemistry*, v. 6, Dec. 1956, p. 559-561.

Acids can be hydrogenated by hydrazine hydrate in ethanol solution at 50 C.

5135 Chemistry of Organic Free Radicals in the Vapor Phase. I. Detection and Reactions of Free Alkyl Radicals. Harold E. de la Mare and William E. Vaughan. *Journal of Chemical Education*, v. 34, Jan. 1957, p. 10-21.

Discusses production and reaction of free alkyl radicals, olefin interaction, nitration, halogenation, and miscellaneous pyrolyses.

5136 The Rearrangement of Isoquinoline-*n*-Oxides. Michael M. Robison and Bonnie L. Robison. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1337-1341.

Rearranges with refluxing acetic anhydride to produce mainly derivatives of the corresponding isocarbostyrils, but also significant quantities of the corresponding 4-hydroxy-isoquinoline derivatives.

5137 The Synthesis of ω-Trifluorostearic Acid and ω-Trifluoro-*n*-Octadecyl Amine. Gilbert Gavlin and Richard G. Maguire. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1342-1347.

ω-Trifluorostearic acid was prepared in an eleven-step program based upon the synthesis of ω-trifluorobutyric acid via the intermediates 1,1,1,3-tetrachloropropane and 1,1,1-trifluoro-3-chloropropane.

5138 Flavothebaone. I. Preliminary Work: Spectral Studies and Acetolysis. K. W. Bentley and J. Dominguez. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1348-1352.

The methine base undergoes recyclization of the nitrogen-containing ring under these conditions; only a very small amount of nitrogen-free product was obtained.

5139 N,N-Phthaloyl-L-Glutamic Acid and Some Derivatives. R. Stuart Tipson. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1353-1357.

The reaction of L-glutamic acid with phthalic anhydride at 145-150 C, followed by treatment with boiling water, gave a separable mixture of N,N-phthaloyl-L-glutamic acid, N,N-phthaloyl-DL-glutamic acid, phthalic acid, and L-pyroglutamic acid.

5140 Aminolysis of Esters of Negatively Substituted Acetic Acids. Madeleine M. Joullié, Suzanne Násfay, and Laura Rypstat. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1358-1361.

Salts were obtained from reactions of ethyl γ,γ,γ-trifluoroacetoacetate with primary, secondary, and tertiary amines.

5141 Additions of Hydrogen Bromide to Methylenecycloalkanes. Janes G. Traynham and O. S. Pascual. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1362-1365.

Both ionic and free radical additions proceeded normally; i.e., ionic additions lead to tertiary bromides, and free radical additions to primary bromides.

5142 Preparation and Properties of 1,3-Dioxep-5-Enes. Kent C. Brannock and Gerald R. Lappin. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1366-1368.

Several aldehydes and cyclohexanone react with *cis*-2-butene-1,4-diol to give good yields of 1,3-dioxep-5-enes.

5143 The Potentiometric Titration of Fluorinated Alcohols in Aqueous and Non-Aqueous Systems. C. W. Roberts, E. T. McBee, and C. E. Hathaway. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1369-1370.

The pK_a values for 3-amino-1,1,1-trifluoro-2-propanol and 3-diethylamino-1,1,1-trifluoro-2-propanol were determined in aqueous solution.

5144 The Reaction of 1,3-Dibromobutane With Sodio Malonic Ester. A. T. Blomquist and Joseph Wolinsky. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1371-1373.

With a 200% excess of sodio malonic ester a 35% yield of tetraethyl 2-methyl-1,1,5,5-pentanetetracarboxylate was realized.

5145 Hydrolytic Behavior of Certain Branched Peptide Derivatives of Lysine. Dimitri Theodoropoulos and Lyman C. Craig. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1376-1378.

Experiments have shown that the ε peptide linkage is usually resistant to hydrolysis.

5146 The Synthesis of Some Esters and Amides of β,β-Diarylacrylic Acids. Saul Patai and Raphael Ikan. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1379-1381.

The reaction of 1,1-diarylethylenes with oxally chloride giving β,β-diarylacrylic chlorides was used in the preparation of several aliphatic and aromatic esters.

5147 Chlorinate *o*-Dimethylaminopropylaminodiphenyl Sulfide Derivatives. Alfred Burger and Joseph L. Stanmyer, Jr. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1382-1385.

Several derivatives are synthesized for biological evaluation.

5148 Synthesis of *N*-(8-Hydroxy-2-Fluorenyl)Acetamide. Elizabeth K. Weisburger and John H. Weisburger. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1386-1387.

N-(8-Hydroxy-2-fluorenyl)acetamide was synthesized in five steps from 1-fluorenecarboxylic acid.

5149 Reaction of the Acid Chlorides of Aromatic Acids With Bromine and Silver Oxide. F. A. H. Rice and W. Morganroth. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1388-1389.

Acid chlorides of several aromatic acids, on treatment with Ag_2O and Br in CCl_4 solution lose CO_2.

5150 Triazines. XVII. *s*-Triazine From *s*-Triazine-2,4,6-Tricarbonic Acid. Christoph Grundmann and Ehrenfried Kober. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1392-1394.

A method for preparing the pure acid oxide which can be converted by thermal decarboxylation into *s*-triazine with a yield of 34% under conditions which prevent decomposition.

5151 The Photoöxidation of Tetracyclone. Norbert M. Bikales and Ernest I. Becker. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1405-1407.

The photoöxidation of tetracyclone in benzene affords *cis*- and *trans*-dibenzoylstilbene, tetraphenyl-2-pyrone, and CO.

5152 Studies in Chalcones and Related Compounds Derived From 2-Hydroxy-5-Acetaminoacetophenone. I. Synthesis of 2-Hydroxy-5′-Acetaminochalcones and 6-Aminoflavanones. A. A. Raval and N. M. Shah. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1408-1411.

5153 2-Hexadecenoic Acid and Related Compounds. Roger S. Sweet and Frances L. Estes. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1426-1429.

α-Bromo-, α-iodo-, and α-hydroxy-palmitic acids and 2-hexadecenoic acid were prepared and characterized.

5154 *tert*-Carbinamines. V. The Addition of Isothiocyanic Acid to Camphene. Leo S. Luskin, Albert J. McFaull, and G. E. Gantert. *Journal of Oragnic Chemistry*, v. 21, Dec. 1956, p. 1430-1431.

The reaction gave 2-isothiocyanatoisocamphane.

5155 Reactions of 9-Halodihydro- and -Tetrahydro-*exo*-Dicyclopentadienes With Strong Bases. George T. Youngblood and Pelham Wilder, Jr. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1436-1438.

5156 Unsaturated Cyclic Sulfones. II. Displacement and Elimination Reactions. Robert C. Krug and Teh Fu Yen. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1441-1444.

5157 Recrystallization of Organic Compounds From Detergent-Water Systems. J. M. Sugihara and Stanley R. Newman. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1445-1447.

Organic compounds with significant water solubilities were purified by a single recrystallization from water containing small amounts of a detergent to yield products of greater purity than derived from a normal single aqueous recrystallization. This is particularly useful when handling small amounts of material.

5158 Relative Reactivities of the Common Ring Bromomethylcycloalkanes. E. Earl Royals and Arthur H. Neal. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1448-1457.

5159 5-(*p*-Chlorobenzyl)-2-Hydroxybenzaldehyde and Some of Its Derivatives. Ng. Ph. Buu-Hoi, T. B. Loc, and Ng. D. Xuong. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1458-1460.

Preparation and properties.

5160 Vinylphenol Derivatives. J. L. R. Williams, D. G. Borden, and T. M. Laakso. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1461-1463.

5161 The Synthesis and Infrared Absorption Spectra of Some *m*-Polyphenyls. Roy L. Alexander, Jr. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1464-1466.

5162 Nitration Studies. IX. Preparation of Haloalkyl Nitrates by Liquid Phase Reaction of Nitrogen Tetroxide and Halogens With Alkenes. G. Bryant Bachman and Ted J. Logan. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1467-1469.

Alkenes were found to react with mixtures of halogens and dinitrogen tetroxide in liquid phase to form β-haloalkyl nitrates. The orientation of the addition suggests that the alkene first adds a positive halogen ion and then a negative nitrate ion to form a haloalkyl nitrate.

5163 Mescaline Analogs. V. *p*-Dialkylamino-β-Phenethylamines and 9-(β-Aminoethyl) Julolidine. F. Benington, R. D. Morin, and L. C. Clark, Jr. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1470-1472.

The syntheses of several new substituted dialkylamino-β-phenethylamines having potential physiological interest are described. Biochemical studies are in progress to determine whether these substances possess mescaline like activity.

5164 Addition Reactions of Arylalkanes and Maleic Anhydride Occurring by Chain Processes. Harold Shechter and Harold C. Barker. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1473-1477.

5165 Substitution Reactions of Hexachlorobenzene. Albert L. Rocklin. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1478-1480.

Hexachlorobenzene reacts easily with nucleophilic reagents. Reaction rates are faster in pyridine than in other solvents tested.

5166 The Synthesis of Spiropentane-*d*$_8$. Herbert O. House, Richard C. Lord, and H. Shreepathi Rao. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1487-1491.

5167 Errors in Quantitative Tracer Studies. Gus A. Ropp. *Journal of Chemical Education*, v. 34, Feb. 1957, p. 60-63.

Examples resulting from isotopic dilution after synthesis.

5168* (German.) Autoxidation of Non-Saturated Compounds. **Uber die Autoxydation ungesättigter Verbindungen. VII.** Spontaneous Autoxidation of Oleic Acid and Elaidic Acid Methyl Esters. **Die spontane Autoxydation des Ölsäure- und des Elaidinsäuremethylesters.** W. Kern, F. Sietz, and H. Willersinn. *Makromolekulare Chemie*, v. 22, Jan. 1957, p. 47-58.

Kinetics of the autoxidation of pure methyl oleate and of pure methyl elaidate show that the rate of autoxidation increases with the first power of the degree of autoxidation.

5169* The Oxidation of β-Aroyl Propionic Acids by Sodium Hypochlorite. John D. Reinheimer and Ellis W. List, Jr. *Ohio Journal of Science*, v. 57, Jan. 1957, p. 26-28.

5170 Organo-Metallic Compounds. G. E. Coates. 197 p. 1956. John Wiley & Sons, New York. (QD411 C630)

Preparation, structure, and properties.

5171* Reactions of Conjugated Fatty Acids. III. Kinetics of the Diels-Alder Reaction. L. E. Gast, E. W. Bell, and H. M. Teeter. *Paint Industry Magazine*, v. 72, Jan. 1957, p. 10, 12, 14, 48.

Reaction between diethylazodicarboxylate and t,t,-9-11-octadecadienoic acid.

5172* The Chemistry of the Perhydro-Azulene Sesquiterpenoids. I. P. de Mayo. *Perfumery and Essential Oil Record*, v. 48, Jan. 1957, p. 18-22.

A study of the structures of these compounds.

5173 The Reactive Intermediates of Organic Chemistry. John E. Leffler. 275 p. 1956. Interscience Publishers, New York. (QD255 L52r)

Evidence for free radicals, carbonium ions, negative carbon ions, and other intermediates. Comparison of radical and polar mechanisms.

5174 Transannular Nitrogen-Carbonyl Interactions. Nelson J. Leonard. *Record of Chemical Progress*, v. 17, no. 4, 1956, p. 243-257.

A review of the literature provides evidence for occurrence of transannular nitrogen-carbonyl interaction and for its limitation by ring-size, steric strain, environmental, and electronic factors.

5175 (Italian.) Selective Extraction of Hydrocarbons in the Liquid Phase. **Estrazione selettiva in fase liquida di idrocarburi. I.** Distribution Balance of Aromatic and Paraffin Hydrocarbons With a Dioxidinitrile bis-β-Cyanoethoxy-Ethane 1,2. **Equilibri di repartizione di idrocarburi aromatici e paraffinici con un diossidinitrile (bis-β-cianoetossi)-etano 1,2.** D. Ripa, A. De Angelis, and V. Berti. *Rivista dei Combustibili*, v. 10, Nov. 1956, p. 803-829.

5176* (English.) **Spectrophotometric Studies on Organometallic Complexes Used in Analytical Chemistry on the Germanium Complex With 3-Hydroxytropolone.** Yoshinaga Oka and Shigeki Matsuo. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 8, Dec. 1956, p. 532-539.

Investigation for soluble colored complexes of Ge.

5177 Synthesis of β-Gentiobiose-1-C^{14}. Robert Schaffer and Horace S. Isbell. *U. S. National Bureau of Standards (U. S. Atomic Energy Commission)*, NBS-4616, Apr. 1956, 9 p. (UF767 Un3.1nb Contin.)

Preparation involved degradation of non-radioactive gentiobiose by the Ruff method to 5-*O*-β-*D*-glucosyl-D-arabinose, use of the latter material with sodium cyanide-C^{14} in the Fischer-Kiliani cyanohydrin synthesis, and crystallization of β-gentiobiose-1-C^{14}.

5178* (German.) Preparation of Anhydrous Hydrazine. **Über die Darstellung von Wasserfreiem Hydrazin.** F. Fehér, J. Cremer, and W. Tromm. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 287, Nov. 1956, p. 175-185.

A method was developed for the determination of the hydrazine content by titrating with KIO_3 in a 3 to 5*N* HCl solution with a ± 0.1% accuracy.

5179* (Russian.) Complex Compounds of Hexavalent Uranium With Some Organic Substances. **Kompleksnye soedineniia shestivalentnogo urana s nekotorymi organicheskimi veshchestvami. I.** Complex Uranium Compounds With Some Schiff's Bases. **Vnutrikompleksnye soedineniia urana s nekotorymi shiffovymi osnovaniiami.** I. A. Savich, A. K. Pikaev, I. A. Lebedev, and V. I. Spitsyn. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2736-2741.

Preparation and properties of ten new complex hexavalent U salts.

See also: **4846** (chemistry of organic insecticides); **5263** (oxidation of C by N_2O); **5546** (flammability limits of hydrocarbons); **5602** (solubilities of natural gas hydrocarbons in petroleum); **5613** (fracturing fluids); **5701** (thickener for lubricant greases); **6134** (triethylaluminum complexes).

CHEMISTRY—PHYSICAL

5180 Isotopic Exchange Between $SnCl_4$ and 2-Chlorobutane. Reed A. Howald and John E. Willard. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6217-6220.

5181 Optical Rotatory Dispersion Studies. VII. Application to Problems of Absolute Configurations. VIII. α,β-Unsaturated Ketones and Solvent Effects. Carl Djerassi, Rosemarie Riniker, and Bernhard Riniker. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6362-6389.

5182 The Application of Differential Thermal Analysis to the Study of Reaction Kinetics. Hans J. Borchardt and Farrington Daniels. *American Chemical Society, Journal*, v. 79, Jan. 5, 1957, p. 41-46.

Equations are derived which relate the shape of a differential thermal analysis curve to the kinetics of the reaction giving rise to the curve.

5183 Chemical State of Radio-Iodine in Neutron-Irradiated Periodate After Thermal Treatment. A. H. W. Aten, Jr., G. K. Koch, G. A. Wesselink, and A. M. de Roos. *American Chemical Society, Journal*, v. 79, Jan. 5, 1957, p. 63-66.

5184 Mechanism of E2 Elimination Reactions. Stereospecificity of Elimination Reactions in the 2-Benzenesulfonyl-3-Iodobutane System. Philip S. Skell and James H. McNamara. *American Chemical Society, Journal*, v. 79, Jan. 5, 1957, p. 85-87.

The base-catalyzed dehydrohalogenation of the two diastereoisomeric 2-benzenesulfonyl-3-iodobutanes is stereospecific.

5185 The Mechanisms of Substitution Reactions of Octahedral Complexes: The Induced Aquation of the Halogenopentammineco baltic Ions by Metal Cations. Franz A. Posey and Henry Taube. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 255-262.

5186 Mechanisms of Electron Transfer in Aquo Cations—The Reaction of RH_2O^{+++} With Cr^{++}. R. K. Murmann, H. Taube, and F. A. Posey. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 262-265.

5187 Chlorine Exchange Between Aluminum Chloride and γ-1,2,3,4,5,6-Hexachlorocyclohexane. George W. Pearce and Sonja Krause. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 271-273.

Chlorine exchanges readily at temperatures above 100 C with some decomposition and isomerization, primarily to α-HCC and δ-HCC. Mechanisms for both exchange and isomerization are proposed.

5188 On the Use of Iodine as a Radical Detector in Hydrocarbon Radiolysis. Richard W. Fessenden and Robert H. Schuler. *American Chemistry Society, Journal*, v. 79, Jan. 20, 1957, p. 273-276.

The effects of radiation on solutions of I in cyclohexane were studied over the I concentration range of 5×10^{-6} *M* to 5×10^{-2} *M*.

5189 Isotopic Fractionation in the System Iodine Cyanide/Cyanide by a Combined Equilibration-Precipitation Process. F. E. Jenkins and G. M. Harris. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 276-277.

The equilibrium constant for the reaction $CNI + C^{14}N^- \rightleftarrows C^{14}NI + CN^-$ as predicted by statistical thermodynamics is K=1.05 at 30 C.

5190 Light Scattering Studies of Poly-Soap Solutions. Sisir K. Sinha and A. I. Medalia. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 281-287.

A new type of poly-soap is described. This is a copolymer of styrene with K styrylundecanoate, and thus contains base units with terminal carboxylate groups. Dye solubilization data and solubility behavior of the poly-soap and poly-acid are reported.

5191 The Thermodynamic Properties of Ammonium Fluoride: Heat Capacity From 6 to 309° K, the Entropy, Enthalpy and Free Energy Function. Edwin Benjamins and Edgar F. Westrum, Jr. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 287-290.

Measurements of the heat capacity of NH_4F were made by adiabatic calorimetry over the range 6 to 309 K. In contrast with reports by others of a hump in the heat capacity near 240 K, no thermal anomaly was found in the entire range of measurement. The molal heat capacity and the derived molal entropy and enthalpy at 298.16 K are 15.60 ± 0.02 cal./deg., 17.20 ± 0.02 cal./deg., and 2655 ± 3 cal., respectively.

5192 Photochemical Studies. LII. The Nitrous Oxide-Ethane System. George A. Castellion and W. Albert Noyes, Jr. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 290-293.

The ratio of N formed photochemically at about 1900 Å. in pure nitrous oxide to that formed under identical conditions in a nitrous oxide-ethane mixture is 1.4. This indicates that the primary photochemical process is probably $N_2O = N_2 + O$ and that O atoms react much more rapidly with ethane than with nitrous oxide.

5193 Photoreduction of Triphenylmethane Dyes in the Bound State. Gerald Oster and Judith S. Bellin. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 294-298.

Triphenylmethane dyes do not undergo photoreduction unless they are bound to water-soluble high polymers. In contrast to their behavior in the light, the reduction of these dyes in the dark by strong reducing agents is actually inhibited when the dyes are bound.

5194 Solvents Having High Dielectric Constants. III. Solutions of Sodium and Potassium Halides in N-Methylpropionamide and in N-Methylbutyramide From 30 to 60°. Lyle R. Dawson, Richard H. Graves, and Paul G. Sears. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 298-300.

Properties of solutions of Na and K chlorides and iodides and KBr in N-methylpropionamide and Na and K chlorides in N-methylbutyramide were measured from 30 to 60 C for concentrations ranging from 8×10^{-4} to 0.5 molar.

5195 The Thermodynamic Properties of Acetone. Robert E. Pennington and Kenneth A. Kobe. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 300-305.

The vapor heat capacity and heat of vaporization of acetone were determined calorimetrically. These data were used in conjunction with molecular structure and spectroscopic information to evaluate the barriers to internal rotation in the acetone molecule and to compute tables of the thermodynamic functions.

5196 Concentration Dependence of the Absorption and Fluorescence Spectra of Mixed Crystals of Anthracene With Phenanthrene at 77° K. Jerome W. Sidman. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 305-307.

5197 Microwave Absorption and Molecular Structure in Liquids. XVIII. The Relaxation Times of Four Rigid Polar Molecules Surrounded by Non-Polar Molecules of Similar Sizes and Shapes. Robert C. Miller and Charles P. Smyth. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 308-310.

Measurements of dielectric constant at 300 m. wave length and of dielectric constant and loss at 10.66 cm. wave length were carried out upon quinoline and isoquinoline over a range of temperature.

5198 Thermal Accomodation Coefficients on Gas-Covered Tungsten, Nickel and Platinum. I. Amdur and L. A. Guildner. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 311-315.

Thermal accomodation coefficients of H_2, D_2, He, Ne, N_2, O_2, A, Kr, and Xe on gas-covered W, Ni, and Pt were determined at 9, 50, and 100 C.

5199 The Crystal Structure of Potassium Hydroxylamine-N-Sulfonate. Roger F. Belt and N. C. Baenziger. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 316-318.

The crystal structure of potassium hydroxylamine-N-sulfonate, KSO_3NHOH, was determined from Weissenberg and precession data. The crystals are orthorhombic with cell dimensions a=7.06, b=12.02, c=5.58 Å., Z=4, space group $P2_12_12_1$.

5200 Restricted Rotation in Substituted Ethanes as Evidenced by Nuclear Magnetic Resonance. J. J. Drysdale and W. E. Phillips. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 319-322.

The F magnetic resonance spectra of four substituted *gem*-difluoroethanes are presented and interpreted in terms of restricted rotation about the ethane C-C linkages. Absolute rotational configurations are assigned on the basis of spin-spin splittings and temperature dependencies of the spectra.

5201 Structure of ClF_3 and Exchange Studies on Some Halogen Fluorides by Nuclear Magnetic Resonance. E. L. Muetterties and W. D. Phillips. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 322-326.

The high resolution F^{19} magnetic resonance spectra of ClF_3 at 10, 30, and 40 Mc. are presented and interpreted in terms of the structure of C_2v symmetry for the molecule. Observed temperature dependencies of the spectra of ClF_3 and IF_5 are interpreted.

5202 The Kinetics of the Reactions of Phenyl Isocyanate With Certain Thiols. Elizabeth Dyer and John F. Glenn. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 366-369.

The reactions of phenyl isocyanate in the presence of triethylamine with 1-butanethiol and with 1-dodecanethiol, each in toluene solution at 25 C, followed approximate second-order kinetics during the early stages and showed product catalysis as the reactions progressed.

5203* Spectrophotometric Studies. VI. Chromium Complexes. D. Ramaswamy and Y. Nayudamma. *American Leather Chemists Association, Journal*, v. 52, Feb. 1957, p. 67-89.

Spectrophotometric curves in the ultra-violet region were obtained for basic Cr sulfate solutions complexed with various organic acids and mixtures of these acids and their salts.

5204 The Migration of Double Bonds During the Isomerization of Methyl Linoleate With Palladium on Carbon Catalyst. K. H. Takemura and L. A. Goldblatt. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 15-17.

5205 Emulsion Stability. Lloyd Osipow, Saul Birsan, and Foster Dee Snell. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 34-38.

A theory concerning emulsion stability only insofar as it relates to coalescence.

5206 Detection of Polymorphic Phase Transformations by Continuous Measurement of Electrical Resistance. Paul D. Garn and Steward S. Flaschen. *Analytical Chemistry*, v. 29, Feb. 1957, p. 268-271.

5207* Alternating Current Polarography of Organic Compounds. VI. Further Development of the Theory. B. Breyer and H. H. Bauer. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 437-442.

Theoretical treatment permits evaluation of the adsorption coefficients of the oxidized and reduced forms at the electrode surface.

5208* Direct Current Measurements of the Conductance of Solutions of Sodium and Potassium Chloride at 25°C. H. H. Lim. *Australian Journal of Chemistry*, v. 9, Nov. 1956, p. 443-449.

5209* (French.) Correlations Between the Absorption Spectra and the Chemical Structures of Compounds Having Aromatic Nuclei and Conjugate Double Bonds. **Corrélations entre les spectres d'absorption et les structures chimiques de composés à noyaux aromatiques et à doubles liaisons conjugées.** Jacques J. Panouse. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1568-1573.

Derivation of a general relationship between the chemical structure and the first maximum of UV or visible absorption.

5210* (French.) Tables for the Direct Calculation of the Equilibrium Constants of Chemical Systems. **Tables pour le calcul direct des constantes d'equilibre des systèmes chimiques. III.** Henri Mauras. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1642-1646.

Tables of the component equilibrium factors concerning the saturated ethylene, acetylene, and benzene hydrocarbons and examples of application.

5211* (French.) Chemistry of the Atoms Resulting From the $^{14}N(n,p)^{14}C$ Nuclear Reaction in the 5,6-Benzacridine Molecule. **Chimie des atomes résultant de la réaction nucléaire $^{14}N(n,p)^{14}C$ dans la molécule de 5,6-benzacridine.** Roland Muxart and Guy Pinte. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1675-1679.

From 5,6-benzathracene marked by radiocarbon-14, using slow neutrons to irradiate a nitrogenous heterocycle the 5,6-benzacridine was obtained. The radioactivity of these substances was respectively 0.2% and 4% of the total activity that was produced.

5212 Adsorption From Binary Liquid Mixtures on Activated Alumina. J. J. Kipling and D. B. Peakall. *Chemical Society, Journal*, Dec. 1956, p. 4828-4840.

Data for physical adsorption from binary mixtures of completely miscible liquids by different types of alumina are analyzed to give the isotherms for the individual components.

5213 Kinetics and Mechanism of Bromination of Phenol With Bromine and Iodine Bromide in Glacial Acetic Acid and Carbon Tetrachloride. Lourdu M. Yeddanapalli and N. S. Gnanapragasam. *Chemical Society, Journal*, Dec. 1956, p. 4934-4943.

5214* (German.) Effect of Gamma Rays on Chemical Reactions. **Einwirkung von Gammastrahlen auf chemische Reaktionen.** Rudolf Auerbach. *Chemiker-Zeitung*, v. 81, Jan. 10, 1957, p. 3-5.

In reactions taking place between ions or radicals, the rays of radioactive isotopes can act as a residue-free catalyst. Gamma-ray chemistry may open up new chemical fields.

5215* Very High Temperature Reactions. George Porter. *Chemistry*, v. 30, Jan. 1957, p. 4-10.

Shock tubes and flash photolysis permit heating a gas to a very high temperature, in a minute fraction of a second, quite uniformly, and without heating the vessel at all.

5216 Applications of Infrared Spectroscopy in Chemical Industry. Recent Advances in Infrared Structural Analysis. L. J. Bellamy. *Chemistry & Industry*, no. 2, Jan. 12, 1957, p. 26-28.

Structural correlation with frequencies; intensity studies; relationship between frequencies and physical properties.

5217* (French.) A Simple and Accurate Method for Determining the Nature of Hydrocarbons From Their Viscosity, Refractive Index, and Density. **Développement d'une méthode pour la détermination simple et précise de la nature des hydrocarbures à partir de la viscosité, de l'indice de réfraction et de la densité.** J. Cornelissen and H. I. Waterman. *Chimie & Industrie*, v. 76, Nov. 1956, p. 1019-1031.

5218* (Russian.) Catalysis on Semiconductors. The Catalytic Properties of Metallic Germanium. **Kataliz na poluprovodnikakh. Kataliticheskie svoistva metallicheskogo germaniia.** O. V. Krylov, S. Z. Roginskii, and V. M. Frolov. *Doklady Akademii Nauk SSSR*, v. 111, Nov. 21, 1956, p. 623-625.

Effect of Ge on a stoichimetric mixture of $2H_2 + O_2$ at 200 to 400 C. Kinetic curves of dehydration of isopropyl alcohol on powdered Ge.

5219* (Russian.) An Investigation of the Ionic Conductivity of KI (Tl) - Phosphors. **Issledovanie ionnoi provodimosti KI (Tl)-fosforov.** L. M. Shamovskii, A. A. Dunina, and M. I. Gosteva. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 811-814.

Behavior of the structural conductivity of KI crystals when various quantities of the activator are added.

5220* (Russian.) The Adsorption Properties of Silica Gel as Influenced by a Chemical Modification of Its Surface. **O vliianii khimicheskogo modifitsirovaniia poverkhnosti silikagelia na ego adsorbtsionnye svoistva.** K. D. Shcherbakova and K. I. Slovetskaia. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 855-858.

Properties of methylated and chlorinated silica gels.

5221* (Russian.) Adsorption of Methane by Carbon Black and Coal Above and Below Critical Temperature. **Adsorbtsiia metana sazhei i uglem vyshe i nizhe kriticheskoi temperatury.** A. V. Kiselev, F. Z. Sabirov, I. L. Ettinger, and M. F. Ianovskaia. *Doklady Akademii Nauk SSSR*, v. 111, Nov.-Dec. 1956, p. 129-132.

Investigation of adsorptive abilities with respect to coal mine operation.

5222 Elementary Wave Mechanics, With Applications to Quantum Chemistry. W. Heitler. 2nd Ed. 193 p. 1956. Oxford University Press, London. (QC174.2 H36e2)

Designed for use by chemists and other non-mathematical readers. Illustrates methods of wave mechanics and their use in solving chemical problems.

5223 Electric Dipole Moments of Solutes in Non-Polar Solvents. A. D. Buckingham. *Faraday Society, Transactions*, v. 52, Dec. 1956, p. 1551-1556.

The rigorous classical statistical-mechanical theory of dielectric polarization is applied to the special case of a dilute solution of a polar solute in a non-polar solvent.

5224 The Physical Properties of Some Fluorine Compounds and Their Solutions. III. Perfluorocyclohexane and Perfluoromethylcyclohexane. J. S. Rowlinson and R. Thacker. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 1-8.

Determination of vapor pressure, critical temperature, approximate critical pressure, triple point, density and infra-red spectra. Vapor-phase chromatography provides a sensitive test for impurities in these fluorocarbons, down to an apparent lower limit of a few parts per thousand.

5225 Thermodynamics of Binary Systems Containing Amines. III. Correlation of Thermodynamic Functions and Phase Diagrams. J. L. Copp and D. H. Everett. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 9-18.

The general thermodynamic conditions for phase separation in a binary system are expressed in a new graphical form. Data are presented for the phase diagrams of methyldiethylamine + water and triethylamine + water.

5226 The Behaviour of the Ammonium Ion in the Ammonium Salt of Tetraphenylboron by Comparison of the Heat Capacities of the Ammonium, Rubidium, and Potassium Salts. T. Davies and L. A. K. Staveley. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 19-30.

A calorimeter for the accurate determination of heat capacities of solids and liquids using comparatively small quantities. It was used to measure the molar heat capacity C_p from 20 to 298 K of the ammonium, K and Rb salts of tetraphenyl B.

5227 The Kinetics of the Reaction Between Acetaldehyde and Nitrogen Dioxide. A. E. Pedler and F. H. Pollard. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 44-50.

Studies at 110 to 180 C.

5228 Kinetics of the Reduction of Permanganate in Aqueous Solution by Molecular Hydrogen. A. H. Webster and J. Halpern. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 51-60.

Studies on aqueous solutions of composition ranging from 1.0 M H^+ to 0.6 M OH^-. The reaction was catalyzed by Ag salts.

5229 The Diffusion of Sodium Ions in Analcite as a Function of Water Content. I. R. Beattie and A. Dyer. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 61-66.

The conductivity of analcite (Na_2O, Al_2O_3, $4SiO_2$) was measured as a function of temperature and water content. The self-diffusion of sodium ions was studied using ^{22}Na. The results are shown to be in agreement with the conductivity data for analcite containing more than 25% of water.

5230 Hydrogen Ions. Their Determination and Importance in Pure and Industrial Chemistry. v. I. 4th Rev. Ed. Hubert T. S. Britton. 476 p. 1956. D. Van Nostrand Co., Princeton. (QD561 B77h4)

5231* Methods of Growing Crystals. M. A. Short. *Industrial Chemist*, v. 33, Jan. 1957, p. 3-8.

A comprehensive review of methods from the solid state, melt, vapor, and solution.

5232 Reactions in Sodium Hydroxide-Nickel System. D. M. Mathews and R. F. Kruh. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 55-58.

Reactions between NaOH and Ni, carried on in vacuum at temperatures near 1000 C, have produced H, water, Na_2O, Ni oxide, Na nickelate, and Na.

5233 Correlating Vapor Pressures and Other Physical Properties. Donald F. Othmer, Paul W. Maurer, Charles J. Molinary, and Ronald C. Kowalski. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 125-137.

A general equation and nomogram have been designed for conveniently correlating vapor pressures, latent heats, and other physical properties of over 500 compounds.

5234 Hydrofluoric Acid and Acidity of Alumina. A. N. Webb. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 261-263.

The fact that the amount of ammonia chemisorbed by alumina is independent of hydrofluoric acid addition is interpreted to mean that the number of acidic sites is not affected.

5235 Catalytic Properties of Rare Earths. V. I. Komarewsky. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 264-265.

Neodymium and samarium oxides are good alcohol dehydrogenation catalysts and their activity substantially improves with deposition on alumina.

5236 Carbon Monoxide-Steam Reaction on Ruthenium Catalysts. Giuseppe Parravano. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 266-271.

Rate of reaction, depending on temperature and partial pressure ratios, may be controlled by reaction between adsorbed materials or between CO and the oxidized Ru surface.

5237* A Laboratory for Studying the Chemical Effects of Gamma Rays. J. F. Black, J. F. Kunc, Jr., and G. B. Clark. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 256-269 + 1 plate.

Remote-operation and other equipment for studies of reactions of interest to the petroleum industry.

5238* (Russian.) Dynamic Method of Vapor Adsorption Measurement Applied for Determination of Catalyst Surface. **Ispol'zovanie dinamicheskogo metoda izmereniia adsorbtsii parov dlia opredeleniia velichiny poverkhnosti katalizatorov.** A. M. Rubinshtein and V. A. Afanas'ev. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 11, Nov. 1956, p. 1294-1303.

For a specific surface up to 20 sq. m. per g. the error does not exceed 10%. This is true for pure MgO and mixed MgO catalysts. Describes preparation of the specimens.

5239 Conjugation With Lone-Pair Electrons. II. The Adsorption of Naphthols by Cationic Micelles in Dilute Aqueous Solution. T. Nash. *Journal of Applied Chemistry*, v. 6, Dec. 1956, p. 539-546.

The conditions under which dilute aqueous solutions of cetyl trimethyl ammonium bromide and naphthol form elastic gels are investigated by a semi-quantitative method.

5240 Configuration of a Polyelectrolyte Chain in Solution. Irvin M. Krieger. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 1-4.

Gives an expression for the configuration of a random chain having central interactions among its groups.

5241 Comment on the Significance of Diffusion Potentials in Ion Exchange Kinetics. R. Schlögl and F. Helfferich. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 5-7.

5242 Simple Molecular Orbital Treatment of Conjugation in Chlorobenzene. John A. Howe and J. H. Goldstein. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 7-9.

Spectroscopic parameters were used.

5243 Theoretical Investigation of Vibrational Frequency Distributions for Molecular Crystals Having the Cyanogen Iodide Structure. Thomas H. Walnut. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 10-18.

The eigen frequencies of the vibrational problem are calculated with the first order perturbation theory for the CNI lattice.

5244 Electron Impact Studies on C_2H_5Cl, C_2H_5Br, and C_2H_5I. A. P. Irsa. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 18-22.

The appearance potentials and process of formation of the $C_2H_5X^+$, $C_2H_5^+$, CH_2X^+, and HI^+ ions were studied permitting certain ionization potentials and bond energies to be derived.

5245 Vibration-Hindered Rotation Interactions in Methyl Alcohol. The J=O→1 Transition. Karl T. Hecht and David M. Dennison. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 48-69.

5246 Correlation Energies in Atoms and Electron Affinities. Tadashi Arai and Tsuyoshi Onishi. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 70-74.

The orbital approach is applied to the 2, 3, and 4 electron systems of atoms and ions.

5247 Vibrational Spectra and Structure of Solid Sulfamic Acid and the Sulfamate Ion. A. M. Vuagnat and E. L. Wagner. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 77-82.

Infra-red spectra of sulfamic acid, sodium and potassium sulfamates, and the corresponding deutero-compounds were obtained.

5248 Near Ultraviolet Spectrum of Crystalline Hexamethyl Benzene and the Structure of the Hexamethyl Benzene Molecule. O. Schnepp and Donald S. McClure. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 83-92.

Spectra of oriented crystals were photographed at high resolution with polarized light at 20 K.

5249 Dislocations as "Active Sites" in Heterogeneous Catalysis. Leland E. Cratty, Jr. and Andrew V. Granato. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 96-97.

Catalytic activity of Ni foil is evaluated.

5250 Rate of Dissociation of Bromine in Shock Waves. H. B. Palmer and D. F. Hornig. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 98-105.

Rate was measured from 1200 to 2225 K.

5251 Matrix Isolation Studies: Infrared Spectra of Intermediate Species in the Photolysis of Hydrazoic Acid. Edwin D. Becker, George C. Pimentel, and Mathias Van Thiel. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 145-150.

Hydrazoic acid (HN_3) is suspended in Xe, A, and N matrices at 20 K.

5252 Relative Rates of Some Very Rapid Gaseous Bimolecular Reactions. Jerome Daen and R. A. Marcus. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 162-168.

A steady-state flow apparatus permits the measurement of relative rates of rapid gas phase bimolecular association reactions at very low pressures.

5253 Vaporization Coefficient of Graphite and Composition of the Equilibrium Vapor. R. J. Thorn and G. H. Winslow. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 186-196.

The Knudsen cell yields a value of about 0.15 for the vaporization coefficient.

5254 The Ratio of the Positive and Negative Light Ion Conductivities Within a Neutral Aerosol Space. Ross Gunn. *Journal of Colloid Science*, v. 11, Dec. 1956, p. 691-696.

Ratio may be expressed in terms of the number of particles per unit volume, their size, the rate of ion pair formation, the light ion mobilities, and recombination coefficient.

5255* Phase Diagram and Vapor Pressure in the Systems NaCl-$ZrCl_4$, KCl-$ZrCl_4$, and NaCl-KCl (1:1 molar)-$ZrCl_4$. L. J. Howell, R. C. Sommer, and H. H. Kellogg. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 193-200.

Particular attention was given to locating compositions which might be useful for electro-deposition of Zr.

5256 Absorption Spectra of Metal Complexes of Flavonoid Compounds. Leonard Jurd and T. A. Geissman. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1395-1401.

5257 Studies on the Ultraviolet Absorption Spectra of Coumarins and Chromones. I. B. K. Ganguly and P. Bagchi. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1415-1419.

Spectra in the 220 to 340 mμ. region show that it is possible to distinguish coumarins and chromones on the basis of absorption characteristics.

5258 Activated Complex Energies. Richard Snow and Henry Eyring. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 1-6.

Studies of the reaction $H + H_2$ in terms of a more general trial wave function than has been used previously.

5259 Stability and Reactivity of Molecules From the Standpoint of Molecular Orbitals. Virginia Griffing and John S. Dooling. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 11-19.

5260 Valence in the Boron Hydrides. William N. Lipscomb. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 23-27.

Nature of bonding and charge distribution in the known boron hydrides is discussed from the point of view of a simplified localized three-center orbital, and briefly from the more general molecular orbital point of view.

5261 A Mass Spectrometric Appearance Potential Study of Diborane. John L. Margrave. *Journal of Physical Chemistry* v. 61, Jan. 1957, p. 38-40.

The ionization potential of B_2H_6 is 12.1 ± 0.2 e.v.

5262 Present Situation of Quantum Chemistry. Per-Olov Löwdin. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 55-68.

5263 The Oxidation of Carbon by Nitrous Oxide. R. Nelson Smith, David Lesnini, and John Mooi. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 81-86.

Reaction mechanism appears to be simply a rapid oxidation of the active part of the surface by N_2O to form C-O complexes and N_2, followed by further slow reaction of N_2O with these complexes to produce CO_2 and more N_2.

5264 Rates of Isomerization of Triethyl Phosphite to Diethyl Ethyl Phosphonate in the Presence of Ethyl Iodide. A. F. Isbell, G. M. Watson, and R. E. Zerwekh, Jr. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 89-92.

Rates were determined by continuous density measurements at 90, 100, and 110 C over a concentration range from 10 to 56 mole % ethyl iodide. The initial 60 to 70% of the reaction was found to be zero order with respect to triethyl phosphite and first order with respect to ethyl iodide.

5265 Fluorine Magnetic Resonance Studies of Some Solid Fluoroethanes. H. S. Gutowsky and Masatami Takeda. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 95-97.

5266 Thermal Isotopic Exchange Between Ethyl Iodide and Molecular Iodine in the Liquid Phase. L. R. Darbee and G. M. Harris. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 111-112.

Exchange mechanism apparently involves a one-to-one ethyl iodide-iodine complex. The increase in exchange rate with time is due to further build-up of I^- concentration.

5267 Spectral Absorbance of Some Aqueous Solutions in the Range 10° to 40°C. Elizabeth E. Sager and Fleur C. Byers. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 33-36.

Solutes included KNO_3, $K_2Cr_2O_7$, diphenylsulfone, diphenyl phosphate, 4,4'-diaminobenzophenone, and m-cresolsulfonphthalein.

5268* Streaming Birefringence. I. The Principles Involved. F. A. Glover and S. F. Suffolk. *Laboratory Practice*, v. 6, Jan. 1957, p. 20-24.

Study of this phenomenon may be used to derive information on the size and shape of the particles in solution. The required apparatus and interpretation of the measurements are discussed. (To be continued.)

5269 Light-Scattering in Physical Chemistry. K. A. Stacey. 230 p. 1956. Academic Press, New York. (QD501 St12L)

Modern developments in the theory and application of light scattering, particularly in the study of macromolecules. Covers high polymers, proteins, and polyelectrolytes.

5270 Moisture Vapor Transfer Study Results in New Theory. Barney Hilton. *Package Engineering*, v. 2, Feb. 1957, p. 28-30, 32-34.

Suggests that water vapor concentration on the surface is the driving force for transfer. It depends more nearly upon relative humidity than on absolute humidity, and the transfer varies logarithmically with the vapor pressure.

5271* (English.) **The Infrared Absorption of Rosin Acids and Their Derivatives. I. Abietic and Primaric Acids.** Henrik H. Bruun. *Paperi ja Puu*, v. 38, no. 12, 1956, p. 577-582.

Following a short review of the constitution and stereochemical configurations of rosin acids, infra-red absorption spectra are presented for abietic, dehydroabietic, dihydroabietic and tetrahydroabietic acids and for dextropimaric and isodextropimaric acids.

5272. Paramagnetic Resonance in Some Complex Cyanides of the Iron Group. I. Experimental Results. J. M. Baker, B. Bleaney, and K. D. Bowers. **II. Theory.** B. Bleaney and M. C. M. O'Brien. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1205-1230.

5273 Some Elastic Properties of Organic Glasses in the Transition Region From Solid to Liquid at Ultrasonic Frequencies. Sheila M. Crawford. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1312-1318.

Measurement of dynamic shear properties of four organic glasses at a frequency of 4 Mc.

5274 Electronic Properties of Aromatic Hydrocarbons. III. Diffusion of Excitons. O. Simpson. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 402-411.

Work suggests that in anthracene, which is strongly anisotropic, the migration of excitons occurs most easily between molecules in adjacent planes.

5275 A Discussion on the Meaning of Equivalent Weights and Transport (Transference) Numbers for Amphoteric Electrolytes, Especially Protolytes. Harry Svensson. *Science Tools*, v. 3, Dec. 1956, p. 30-35.

5276* The Solubilisation of Perfumery Materials by Surface-Active Agents. C. D. Moore and Maurice Bell. *Soap, Perfumery and Cosmetics*, v. 30, Jan. 1957, p. 69-76.

The general nature of solubilization; constitution of non-ionic, quaternary ammonium, and alkylolamide compounds; data from solubilization trials; practical application of surface-active agents in perfume formulation.

5277 (German.) Thermodynamics of Mixed Phases. **Thermodynamik der Mischphasen.** Rolf Haase. 597 p. 1956. Springer-Verlag, Berlin. (QD501 H11t)

Advanced study of that part of classic thermodynamics which deals with systems having many homogeneous bodies and at least two substances. Includes equilibrium conditions and differential equations of coexisting phases.

5278 Crystal Structures of Transition Metal Silicides. Carol H. Dauben. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3602, Oct. 1956, 8 p. (UF767 U3u Contin.)

Tables show ideal structure type, lattice constants, space groups, and references.

5279* Chemistry and Spin-Resonance Spectroscopy of Radicals From Thioaromatic Compounds. Antonino Fava, Power B. Sogo, and Melvin Calvin. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3531, Nov. 1956, 16 p. (UF767 U3u Contin.)

5280 Kinetics of Gaseous Reactions in the Range 1000° to 1800° C.; Study at High Temperatures of the Reactions Between Nitrogen and Metals, Particularly Magnesium and Aluminum. Farrington Daniels. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 56-536, July 1956, 27 p. (TL507 Un3.18w Vis.)

5281* (German.) Catalytic Reactions of Peroxysulfuric Acid. **Über die Katalyse der Reaktionen der Peroxyschwefelsäure. II.** Catalysis in the Reaction Between Peroxydisulfate and Iodide-Ions. **Katalyse in der Rekation zwischen Peroxydisulfat und Jodid-Ionen.** Helene Galiba, L. J. Csányi, and Z. G. Szabó. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 287, Nov. 1956, p. 169-174.

Simultaneous effect of Cu- and Fe-ions in the reaction between peroxy-sulfate and iodide as an aid for electron transfer.

5282* (German.) Density Measurement. **Dichtemessungen. XVIII.** Volume Change During Smelting Processes of Salts. **Über die Volumenänderung beim Schmelzen und den Schmelzprozess bei Salzen.** Herbert Schinke and Franz Sauerwald. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 287, Nov. 1956, p. 313-324.

Δ V Values of various salt-groups, especially of alkali and silver iodides, chlorides, and bromides.

5283* (Russian.) Methods of Crystallization of Isomorphous Mixtures of Salts From Aqueous Solutions. **Puti kpistallizatsii izomorfnykh smesei solei iz vodnykh rastvorov.** S. K. Chirkov. *Zhurnal Neorganicheskoi Khimii*, v. 1, no. 12, 1956, p. 2813-2819.

Studies of simple heterogeneous systems consisting of two isomorphic salts and water.

5284* (Russian.) Electrical Conductivity of Titanium Slags. **Elektroprovodnost' titanistykh shlakov.** B. M. Lepinskikh, O. A. Esin, and S. V. Shavrin. *Zhurnal Prikladnoi Khimii*, v. 29, Dec. 1956, p. 1813-1821.

The specific electrical conductivity in Na_2O-TiO_2, FeO-TiO_2, and MnO-TiO_2 systems was measured at various compositions and temperatures. Its value decreases with an increase of TiO_2 content as in silicate systems.

See also: **4959** (orientation of graphite); **4999** (esterification catalysts); **5001** (preparation and properties of catalysts); **5002** (preformed catalysts); **5004** (hydrogenation catalysts); **5013** (ion exchange processes); **5100** (allylic rearrangements); **5135** (reactions of free alkyl radicals); **5157** (recrystallation of compounds from detergent-water systems); **5367** (dielectric properties of propanol and glycerol); **5500** (absorption of gases in liquid jets); **5755** (application of chemical thermodynamics to study of alloy formation); **6118** (rheology studies); **6132** (viscosity of polymer solutions); **6143** (polymerization catalysts).

COATINGS

5285 Liquid Polybutadiene. J. A. Shotton and C. W. Wolfe. *American Paint Journal*, v. 41, Jan. 21, 1957, p. 78 + 5 pages.

Properties favor use in thermally-cured and air-dried spirit varnishes, as a modifying agent for drying oils and alkyd resins, and in high-temperature coatings.

5286* (Dutch.) Protection Against Moisture by Using a Liquid Rubber Bitumen Product. **Bescherming tegen vocht met vloeibaar rubber-bitumenprodukt.** A. C. van Dorp. *Bedrijf en Techniek*, v. 12, Jan. 12, 1957, p. 15.

Study of a new watertight material called "Rutex" made of rubber and bitumen which is liquid between 30 and 80 C and resists acids and other chemicals. It has good dielectric resistance (disruptive voltage is 840 v.).

5287 Porcelain Enameling Aluminum. V. What Is the Frit Situation for Porcelain Enameling Aluminum? Paul A. Huppert. *Ceramic Industry*, v. 68, Feb. 1957, p. 56-57.

Types of frits and their applications. Typical mixing formulas and resulting compositions.

5288* The Protection of Structures and Plant From Chemical Corrosion by Vinyl Resin-Based Paints. F. A. S. Wood. *Corrosion Prevention and Control*, v. 4, Jan. 1957, p. 43-45.

5289 Modern Marine Paints. A. D. C. Hamilton. *Corrosion Technology*, v. 4, Jan. 1957, p. 5-8.

Surface preparation; application methods; compositions of bottom and topside paints.

5290 Mercury Compositions on Aluminium Alloy Hull Plating. E. G. West. *Corrosion Technology*, v. 4, Jan. 1957, p. 13-14.

Effects of Hg compounds in anti-fouling paints on corrosion of an Al alloy motor-boat.

5291 Corrosion Resistant Linings for Drums. R. M. C. Logan. *Corrosion Technology*, v. 4, Jan. 1957, p. 31-33.

Review of composition and properties of organic coatings.

5292* (Czech.) Using Flux in Zinc Coating With Molten Zinc. **Pouzití tavidla při zinkováni v roztaveném zinku.** Karel Janecký. *Hutník*, v. 6, Oct. 1956, p. 301-304.

Principles of Zn dip coating; properties of materials used as fluxes; preparing and using flux.

5293 Water Resistance and Amine Content in Floor Wax. John A. Frump and John A. Riddick. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 65-67.

5294 Effect of Driers on Linseed Oil and Varnish Films. Composition and Physical Characteristics of Air-Dried Films. E. R. Mueller and Clara D. Smith. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 210-219.

Infra-red absorption studies, chemical and weight gain data, and O functional group analyses show that varnish films dried with drier gain nearly twice as much O as those dried without, and linseed oil films dried without drier gain slightly more O than those dried with the drier.

5295 Aluminum-Coat Steel Parts for All-Weather Wear. R. F. Joy. *Iron Age*, v. 179, Feb. 7, 1957, p. 106-107.

Coating method consists, essentially, of heating in a fused salt flux prior to dipping into an Al bath.

5296 Hard Coatings and Surfaces for Metals. Robert J. Fabian. *Materials & Methods*, v. 45, Jan. 1957, p. 121-140.

Survey of the major types of hard coatings and surfaces. What metals can be treated; hardness and thickness; wear and corrosion properties; chief advantages and limitations.

5297 Electroless Arsenic-Zinc Alloy. Harry J. West. *Metal Finishing*, v. 55, Jan. 1957, p. 56.

Bath operation; uses.

5298 Surface Treatment and Finishing of Light Metals. XII-C. Plating on Aluminum—Zinc Immersion Processes. S. Wernick and R. Pinner. *Metal Finishing*, v. 55, Feb. 1957, p. 61-65.

Theory; effects of solution and alloy compositions, temperature, and pretreatment; double Zn immersion technique; acid fluoride immersion treatment.

5299 Application of Induction Heating to Metallic Diffusion. N. A. Lockington. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 29-33.

An adaptation of induction heating methods to diffusion processes whose mechanism of deposition is comparable to conventional chromizing methods.

5300 Enameling of Zirconium. J. Schultz, H. P. Tripp, B. W. King, and W. H. Duckworth. Paper from "Nuclear Engineering". Pt. IV. Chemical Engineering Progress Symposium Series No. 19. v. LII. American Institute of Chemical Engineers. p. 99-104. (QC776 Am35n)

Enamels were developed which were adherent, free of crazes and other defects, and had low thermal-neutron-absorption cross sections. Frit compositions were based on glasses in the PbO-SiO_2 system. The enamels successfully protected the metal from oxidation when tested in air for 1000 hr. at 600 C.

5301* A Simple Pigment-Settling Gage and a Simple Anti-Sag Test. Temple C. Patton. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Jan. 1957, p. 10-25.

Apparatus, procedure, and test data.

5302* Additives, a Tool in the Formulation of Organic Coatings. Elias Singer. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Jan. 1957, p. 26-43.

Shows how proper use of additives can result in a higher quality paint at no increase in cost, a lower cost paint at no decrease in quality, or both. Typical formulations are evaluated.

5303* Use of the Radioactive Tracer Technique in Aircraft Paints. Alfred L. Glass and Mary S. Pellegrini. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Jan. 1957, p. 49-55.

Radioactive tracer study of adhesion problem demonstrated that no contaminant monomolecular layer of stearic acid would remain on metal substrata after weathered paint films are stripped and the metal cleaned by the procedures recommended for Naval aircraft.

5304* Polymerization and Properties of Fast-Drying Vinyltoluene Oil Copolymers. S. R. Vranish, R. M. Jackman, R. F. Helmreich, and W. A. Henson. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Jan. 1957, p. 56-74.

Viscosity of vinyltoluene-modified drying oils depends upon amount of vinyltoluene in copolymer, type, and viscosity of oil used, type and amount of catalyst, and non-volatile content during polymerization.

5305 The Influence of Some Thickeners on the Rheology of Polyvinyl Acetate Emulsion Paints. G. A. Baseden. *Oil & Colour Chemists' Association, Journal*, v. 40, Jan. 1957, p. 37-50.

5306* A Review of Developments in Industrial Organic Finishing During 1956. *Organic Finishing*, v. 18, Jan. 1957, p. 4-14.

The spread of knowledge; industrial expansion; raw materials; surface preparation and cleaning; application methods; finishes; special purpose and decorative coatings; the rise of color; testing; safety and health.

5307* An Instrument for Determining the Condition of a Surface Coating. Howard R. Moore and James R. Jenness, Jr. *Paint Industry Magazine*, v. 72, Jan. 1957, p. 16, 18.

The rolling friction acting as a steel ball which rolls over a coated surface is determined, and the ratio between the coefficient of rolling friction and the radius of the test ball serves as a dimensionless index of surface condition.

5308 Cationic Surface-Active Agents in Paint Manufacture. D. Bass. *Paint Manufacture*, v. 27, Jan. 1957, p. 5-9.

The fact that these materials are very strongly adsorbed on solid surfaces with the formation of a more or less uninterrupted monomolecular film makes them valuable as chemicals for pigment wetting and aiding dispersion, improving freeze-thaw stability of emulsion paints, and for incorporation in stripping formulations, paint brush cleaners, and germicidal coatings.

5309* Upgrading Drying Oils With Chlorinated Rubber. *Paint and Varnish Production*, v. 47, Jan. 1957, p. 35-39, 96.

Study shows how chlorinated rubber can be dissolved in drying oils and the resulting solution thinned with mineral spirits to form useful vehicle systems.

5310 Vapor Deposition of High-Temperature Coatings. I. E. Campbell. Paper from "Proceedings of the Symposium on High Temperature—A Tool for the Future". Stanford Research Institute, University of California. p. 177-181. (TA460 Sy68p)

Processes that yield coatings which are overlays and are not reacted with, or diffused into the base, and those more suitable processes that yield coatings which are diffused into the base with or without the formation of a compound phase are discussed. The vapor-plating processes are of particular interest in that they can be used to produce very refractory coatings which cannot be produced by more conventional methods on irregularly shaped objects. Details of almost 100 reactions are tabulated.

5311* Finishing Methods for Magnesium Alloy Pressure Die-Castings. A. C. Street. *Product Finishing*, v. 10, Jan. 1957, p. 50-58.

Casting properties and applications; degreasing and cleaning; surface pre-treatments; painting processes, surface sealing; temporary protection methods.

5312* Overcoming Paint Film Defects Caused by Solvent Wash. E. Johnson. *Product Finishing*, v. 10, Jan. 1957, p. 61-63, 120.

Possible solutions include an adjustment of the solvent balance and jigging dipped articles so as to obtain maximum spill.

5313* Developments in Protective Processes: The Phoscadising Process. *Product Finishing*, v. 10, Jan. 1957, p. 64-67.

Process involves the deposition on a scrupulously clean surface of three anti-corrosive barriers, two of which are impregnated into the base metal and the third of which is a sealing coat.

5314* Galvanizing Productivity: Comments on a Recent Study. C. James. *Product Finishing*, v. 10, Jan. 1957, p. 68-78.

A report on productivity in hot dip galvanizing in the U. S. is evaluated in relation to British practice.

5315* Temporary Protective Coatings for Metals. V. Essential Requirements. E. Strong. *Product Finishing*, v. 10, Jan. 1957, p. 79-91.

Tabulated data on the composition of a wide range of temporary protective coatings and on their performances under accelerated test conditions.

5316 Thin Films of Polytetrafluoroethylene Resin (Teflon) as Lubricants and Preservative Coatings for Metals. V. G. FitzSimmons and W. A. Zisman. *U. S. Department of Commerce, Office of Technical Services*, NRL 4753, June 1956, 30 p. (T21 Un3r Contin.)

Reviews the good and bad qualities of Teflon films.

5317* (German.) Hot Aluminum Coating of Steel. **Feueraluminierter Stahl.** K. Zimmermann. *VDI Zeitschrift*, v. 99, Jan. 1957, p. 9-10.

Method of coating; structure of the coating; deformation, corrosion, heat resisting properties. Comparison with other types of coatings.

See also: **5304** (polymerization of vinyl toluene); **5615** (printing ink vehicles); **5802** (coating developments in 1956); **5931** (structure of vapor-deposited Al-Sb coatings).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

5318 Numerical Control of Machine-Tools. O. S. Puckle. *Aircraft Production*, v. 19, Feb. 1957, p. 56-63.

Application of data-control or numerical-control systems to a variety of milling-machines.

5319 Applied Automation. James R. Custer, editor. 236 p. 1956. Chilton Co., Philadelphia. (TL240 Au82a Over.)

This comprehensive review of important automation applications in automotive and aircraft production consists of selected articles published during the past four yrs. in *Automotive Industries.*

5320* Automated Engine Plant. H. R. Bentley. *Automation*, v. 4, Feb. 1957, p. 54-59.

Considerations and principles used in establishing a facility for V-8 engines.

5321* The Guided Missile as a Systems Engineering Problem. Simon Ramo. *Canadian Aeronautical Journal*, v. 3, Jan. 1957, p. 3-9.

General characteristics of systems engineering and the missile proper, and some of the detailed systems interactions involved. (To be continued.)

5322* Modern Large Scale Computer System Design. Walter F. Bauer. *Computers and Automation*, v. 6, Jan. 1957, p. 8-25, 32, 34.

Areas discussed include memory devices, information storage and internal checking, operating speeds, instruction logic, and input-output and off-line equipment.

5323* Transistorized Magnetic Core Memory. *Computers and Automation*, v. 6, Jan. 1957, p. 26-27, 36.

Drive amplifiers; read amplifier; over-all memory system.

5324 Sampled-Data Systems. Donald J. Gimpel. *Control Engineering*, v. 4, Feb. 1957, p. 99-106.

New concepts and devices. Analysis of stability problems arising from intermittent data sampling. Methods of control synthesis.

5325* Signal Pickoffs for Control Systems. I. Donald A. Davies. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 70-77.

Design and application factors for resistance, electrolytic, capacitive, and piezoelectric devices. (To be concluded.)

5326* High Speed Digital Positioning With Binary-Coded Air Cylinders. George E. Comstock, III. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 116-120.

Design and performance of the positioning system used in a random access memory unit.

5327 Electronic Computers. Principles and Applications. T. E. Ivall, editor. 167 p. 1956. Philosophical Library, New York. (TK7872.C5 Ivle)

Principles of digital and analog types. Circuitry and operating details. Possible future trends.

5328 The Junction Transistor as a Computing Element. I. E. Wolfendale, L. P. Morgan, and W. L. Stephenson. *Electronic Engineering*, v. 29, Jan. 1957, p. 2-7.

Transistor characteristics; basic circuits. (To be continued.)

5329 Recent Development in Electronic Computers. J. M. M. Pinkerton. *Endeavour*, v. 16, Jan. 1957, p. 36-41.

Review of equipment, programming, and operating techniques.

5330 Let Erma Do It. The Full Story of Automation. David O. Woodbury. 305 p. 1956. Harcourt, Brace and Co., New York. (T59.5 W85L)

Nontechnical historical review of development of theory and equipment for computers and automation. Social implifications. Future prospects.

5331 Pulse Generator and High-Speed Memory Circuit. Z. Bay and N. T. Grisamore. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-5, Dec. 1956, p. 213-218. (TK1 In6.6e Vis.)

Circuits for the recycling of pulses by means of a driving tube and an electromagnetic delay line.

5332 An Introduction to Cybernetics. W. Ross Ashby. 295 p. 1956. John Wiley & Sons, New York. (Q175 As32i)

Non-mathematical survey of principles and applications.

5333 Where Computers Fit in Metalworking. J. J. Obrzut. *Iron Age*, v. 179, Jan. 17, 1957, p. 71-74.

Uses are so wide and varied as to be limitless; getting enough personnel will be the big problem.

5334* Analog Computer Simulation of a Chemical Reactor. T. L. Batke, R. G. Franks, and E. W. James. *ISA Journal*, v. 4, Jan. 1957, p. 14-18.

Through analysis of dynamic instability problems by means of commercially-available computers, proposed improvements are tested quickly and at low cost.

5335* (Russian.) Evaluating the Quality and Selecting the Parameters of Non-Linear Automatic Systems of High Order. **Otsenka kachestva i vybor parametrov nelineinykh avtomaticheskikh sistem vysokogo poriadka.** E. P. Popov and E. I. Khlypalo. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 12, Dec. 1956, p. 30-47.

Practical application of the method and evaluation of its exactness on various examples of relay systems.

5336* Automatic Control Systems—The Unification of Engineering. Louis F. Kazda. *Journal of Engineering Education*, v. 47, Jan. 1957, p. 415-420.

Review of recent developments. Desirable engineering educational programs.

5337 The Push-Button World. Automation Today. E. M. Hugh-Jones. 158 p. 1956. University of Oklahoma Press, Norman. (TJ213 H87p)

Automation principles and applications. Effect on labor and living conditions.

5338 Crystal Photocell Circuits. Allan M. Ferres. *Radio & Television News*, v. 57, Jan. 1957, p. 58-59, 102-103.

The development of this tiny, light-sensitive cell makes possible an interesting variety of compact control units.

5339 Linear-System Integral Transform Relations. J. Ross MacDonald and Malcolm K. Brachman. *Reviews of Modern Physics*, v. 28, Oct. 1956, p. 393-422.

Basic relations; distribution function relations; illustrative examples.

5340* The Anti-Roll Stabilization of Ships. Joseph H. Chadwick. *Sperry Engineering Review*, v. 9, Nov.-Dec. 1956, p. 2-12.

General principles and practice of anti-roll stabilization. Comparison of alternative stabilizing devices and modes of control. Evaluation of performance on an analogue computer.

5341 Machines That Obey Orders. *Steel*, v. 140, Jan. 21, 1957, p. 68-72.

Numerical controls for machine tools provide versatility and thus reduce small-lot production costs.

5342 On the Use of the Harmonic Linearization Method in Automatic Control Theory. E. P. Popov. *U. S. National Advisory Committee for Aeronautics, Technical Memorandum* 1406, Jan. 1957, p. 1-6. (Translated from *Doklady Akademiia Nauk (SSSR)*, v. 106, no. 2, 1956, p. 211-214.) (TL570 Un3tm)

5343* Self-Checking Codes for Data Transmission. George O. Vincent. *Western Union Technical Review*, v. 11, Jan. 1957, p. 15-21.

While all current practical error detection systems involve redundancy which reduces transmission speed or capacity, there are various pulse count methods and other means available for automatic error-checking.

See also: **5415** (circuit theory); **5728** (automatic assembly line).

ELECTRICAL ENGINEERING

5344 Resistance in Absolute Units by a Combination of Bridge and Resonant Circuits. Donald S. Ainslie. *American Journal of Physics*, v. 25, Jan. 1957, p. 1-3.

A three-part resistance measurement involving a mica capacitor, an audio oscillator, and a resonant circuit, incorporating the oscillator capacitor and a variable inductor.

5345 The Breakdown Mechanism of Certain Triggered Spark Gaps. T. E. Broadbent. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 37-40.

Possible theories of the breakdown mechanism of the trigatron and the thermally triggered spark gap, based on experimental voltage and time lag to breakdown characteristics, corona measurements, and on optical studies using a photomultiplier.

5346* Power Plant Design for Large Liquid-Cooled Generator. J. P. Fitzgerald and C. F. Paulus. *Edison Electric Institute, Bulletin*, v. 24, Dec. 1956, p. 407-412, 420.

5347* Probability Studies Applied to Telecommunication Systems With Storage. E. P. G. Wright and Joseph Rice. *Electrical Communication*, v. 33, Dec. 1956, p. 308-321.

Delays to telegraph messages for varying traffic and numbers of addresses were obtained by throwdown methods for a message-length distribution usually found for such messages.

5348* An Operational Magnetic Amplifier. I. W. L. Marks. *Electrical Energy*, v. 1, Jan. 1957, p. 136-140.

Optimization procedures with bridge magnetic amplifiers are discussed, together with salient design criteria. (To be continued.)

5349* Silicone Materials in Appliance Design. J. F. Dexter. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 78-82.

A combination of characteristics that provide thermal stability over a wide range of temperatures, excellent dielectrical properties, and good average chemical and weathering resistance is now leading to successful use in numerous appliances.

5350* Reliability Approach to Thermal Design and Evaluation. T. C. Reeves. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 83-89, 330, 332.

Methods for evaluating developmental or final circuit designs in terms of the effect of the thermal design on reliability.

5351* Magnet Design. I. Estimating Leakage Factors for Permanent Magnets From Geometry of Magnetic Circuit. R. K. Tenzer. **II. Figuring Air Gaps for Maximum Pull of Opposing Electromagnets.** Keith W. Henderson. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 94-100.

5352* Dip Soldering Printed Circuits. Eugene S. Miller and Alfred A. Johns, Jr. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 124-129.

A subminiature printed circuit system consisting of a group of axial-lead components mounted and dip soldered between two parallel photo-etched boards. Solder bath considerations; description of dip-soldering machine.

5353* Printed Circuits by Electrostatic Methods. Bernard Darrel and Stanislaw Szpak. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 130-132.

Charging and selective discharging of photoconductive films followed by dusting of resinous material, which is then fixed, is a process especially adaptable to mechanization. One method of producing a pattern is by exposure to light, the other by transfer from a shaped capacitor plate.

5354 Electricity, Magnetism, and Atomic Physics. v. I. Electricity and Magnetism. J. H. Fewkes and John Yarwood. 768 p. 1956. University Tutorial Press, Ltd., London. (QC21 F43e)

A comprehensive college text.

5355 Performance Characteristics of Tantalum Capacitors. J. W. Maxwell. *Electronic Design*, v. 5, Jan. 15, 1957, p. 22-25.

5356* Co-Operative Research in the British Electrical Industry. J. Miedzinski. *Engineering Journal*, v. 40, Jan. 1957, p. 15-23, 40.

Development and structure of the Electrical Research Association. Examples of its work on the characteristics of cables and overhead lines, study and abatement of radio interference, and the development and operation of a large analogue computer.

5357* Application of 8-Channel Open-Wire Carrier Telephone Systems in Brazil. A. W. Even and H. J. B. Nevitt. *Ericsson Review*, no. 3, 1956, p. 64-73.

Carrier system features; open-wire line characteristics; transmission planning.

5358* Practical Experience in the Operation of Cross-Bar Exchanges in the Rotterdam Zone. F. W. Van Der Haer. *Ericsson Review*, no. 3, 1956, p. 74-80.

The Netherlands telephone network; maintenance requirements; taffic observations.

5359* Telesignalling Equipment in a Modern Hospital. A. Trägårdh and J. Kamp Jørgensen. *Ericsson Review*, no. 3, 1956, p. 81-90.

General description and operation of intercommunication equipment, clocks, and other components.

5360 Analysis of Electric Circuits Containing Nonlinear Resistance. Louis A. Pipes. *Franklin Institute, Journal*, v. 263, Jan. 1957, p. 47-55.

The proposed methods for transient and steady-state analysis are applied to the analysis of a circuit containing a linear inductor in series with a nonlinear resistor.

5361 Handbook of Power Resistors. H. F. Littlejohn, Jr., compiler. 2nd Ed. 195 p. 1956. Ward Leonard Electric Co., Mount Vernon, New York. (TK2851 L73hz)

A broad analysis of the construction of power resistors, and their application and performance characteristics.

5362* (English.) **66,000 KW Steam Turbine and 81,000 KVA Generator.** Tsutomu Watamori, Ichiro Yokota, Yajuro Kikuchi, and Yoshiaki Korei. *Hitachi Review*, Nov. 1956, p. 3-12.

Construction and capabilities of power plant installation.

5363* The Effect of Furniture on the Coefficient of Utilization. Domina Eberle Spencer. *Illuminating Engineering*, v. 52, Jan. 1957, p. 35-42.

A simple method of calculating the effect of irregularities in room contours on the coefficient of utilization for any lighting installation.

5364 A New Method for the Measurement of the Average Dielectric Constant of the Underground Medium on Site. Mohamed A. H. El-Said. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-4, Oct. 1956, p. 601-604. (TK1 In6.6ap Vis.)

An electromagnetic interference pattern in the far-distance condition is utilized.

5365* Aircraft Generator Insulations Compared to Standard Motor Insulations—Adaptations Possible. A. J. Wesolowski. *Insulation*, v. 3, Feb. 1957, p. 12-15.

Generator construction and insulation requirements; procedures for testing insulation.

5366 Dielectric Behavior of Water at Microwave Frequencies. E. H. Grant, T. J. Buchanan, and H. F. Cook. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 156-161.

Concludes that the relaxation process in water is characterized by a narrow spectrum of relaxation times.

5367 Effect of Pressure on Dielectric Properties and Volume of 1-Propanol and Glycerol. A. Gilchrist, J. E. Earley, and R. H. Cole. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 196-200.

Above was measured to pressures of 1000 kg. per sq. cm. at audio- and radio-frequencies.

3568* Overheating of Electric Motors. J. L. Watts. *Mechanical Handling*, v. 44, Jan. 1957, p. 21-24.

Ways of detecting and remedying faults so as to avoid breakdown. Deals with heat generation and dissipation, starting troubles, variations of starting torque, overheating on load, and protective devices.

5369 Further Experimental Investigation of the Dielectric Losses of Various Glasses at Low Temperatures. J. Volger and J. M. Stevels. *Philips Research Reports*, v. 11, Dec. 1956, p. 452-470.

Importance of impurities in fused silica. Influence of thermal treatment. Comparative survey of the various loss mechanisms. No effect of irradiation was found.

5370 On the Residual Voltage With Electrolytic Capacitors. W. Ch. van Geel and C. A. Pistorius. *Philips Research Reports*, v. 11, Dec. 1956, p. 471-478.

Residual voltage is proportional to the product of field strength and thickness of the oxide layer. The system Al-Al_2O_3 electrolyte was studied.

5371 Ageing of the Dielectric Properties of Barium Titanate Ceramics. K. W. Plessner. *Physical Society, Proceedings*, v. 69, no 444B, Dec. 1956, p. 1261-1268.

Parameters decrease linearly with log t over periods extending to several yrs.

5372 The Influence on Electric Strength of Mechanical Deformation Caused by Application of Voltage to Potassium Chloride Crystals. R. Cooper and A. A. Wallace. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1287-1292.

Describes the magnitude of the electric field in which structural deformation first takes place and the subsequent behavior of specimens.

5373 How Electric Arc Furnace Loads Affect the Utility. Charles W. Vokac. *Power Engineering*, v. 61, Jan. 1957, p. 74-76.

How the furnace's peculiar characteristics increase the cost of generating and distributing electric power.

5374 Bridge for Accurate Measurement of Ferroelectric Hysteresis. H. Diamant, K. Drenck, and R. Pepinsky. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 30-33.

Basic circuit may be described as two parallel Sawyer and Tower circuits, one containing the sample and the other containing resistors and capacitors for the compensation of conductivity and dielectric constant at saturation.

5375* Calculation of Candlepower and Color Temperature of Tungsten Lamps. A. J. Sant and A. J. Leta. *Society of Motion Picture and Television Engineers, Journal*, v. 65, Dec. 1956, p. 645-647.

5376* Four Headlamps for Better Seeing. Val J. Roper. *Traffic Engineering*, v. 27, Jan. 1957, p. 171-175.

Separate lamps for upper and lower beams are recommended for automobiles.

5377* Blank-Character Translation on Submarine Cables. Harold F. Wilder. *Western Union Technical Review*, v. 11, Jan. 1957, p. 2-8.

The "Coffee-grinder" and "Dingbat", two of the significant cable terminal auxiliary equipments capable of transmitting military communications containing blank characters.

See also: **4963** (electro-ceramics); **5425** (measurement of high-value resistors); **5479** (electrical industry forecast); **5480** (electrical utility progress in 1956); **5642** (gas-turbine mobile power station); **5643** (steam-electric power station); **5695** (lubrication of commutator brushes); **5710** (hydraulic torque converter for a.c. motors); **6003** (nuclear electric power plant); **6068** (utility forecasting methods); **6274** (constant potential welding power source); **6275** (soldering of electric circuits).

ELECTROCHEMISTRY

5378 (French.) Electrochemical Behavior of Metals and Metalloids. Voltage-pH Equilibrium Diagram of the System Cr-H_2O at 25°C. **Comportement électrochimique du Chrome. Diagramme d'équilibre tension-pH du système Cr-H_2O à 25°C.** E. Deltombe, N. de Zoubov, and M. Pourbaix. *Centre Belge d'Etude de la Corrosion, Rapport Technique*, no. 41, Oct. 1956, 34 p. (TA462 C33r Contin.)

On the basis of the values of free enthalpies of standard formation of the constituents of the Cr-H_2O system, equilibrium formulas, represented by three voltage-pH equilibrium diagrams of the various possible reactions were established. Trivalent Cr was used and three anhydrous and hydrated oxides of different stabilities were considered.

5379* Recent Developments in Cadmium, Copper and Zinc Protective Electroplating. *Corrosion Prevention and Control*, v. 4, Jan. 1957, p. 37-42, 64.

5380 The Change of Potential of Manganese Dioxide Electrodes on Standing. Stanley Hills and W. C. Vosburgh. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 5-9.

Electrodes of electrodeposited MnO_2 on graphite with electrolytes of NH_4Cl, $(NH_4)_2SO_4$, buffered KCl, or $MgCl_2$ saturated with hydroxide decreased in potential 50 to 100 mv. in 3 months at 50 C. Decrease was accompanied by a loss in available oxygen.

5381 The Mechanism of Deposition of Titanium Coatings From Fused Salt Baths. M. E. Straumanis, S. T. Shih, and A. W. Schlechten. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 17-20.

5382 Electrodeposition of Metals From Organic Solutions. III. Preparation and Electrolysis of Titanium and Zirconium Compounds in Nonaqueous Media. W. E. Reid, Jr., J. M. Bish, and Abner Brenner. **IV. Electrodeposition of**

Beryllium and Beryllium Alloys. Gwendolyn B. Wood and Abner Brenner. **V. Electrodeposition of Magnesium and Magnesium Alloys.** Jean H. Connor, Walter E. Reid, Jr., and Gwendolyn B. Wood. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 21-41.

5383 Electrochemical Polarization. I. A Theoretical Analysis of the Shape of Polarization Curves. M. Stern and A. L. Geary. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 56-63.

5384 Stress in Electrodeposits. R. Pinner. *Electroplating and Metal Finishing*, v. 10, Jan. 1957, p. 7-11.

Effect of plating variables on stress. Effect of stress on coating properties.

5385 Anaconda's New Aluminum Plant Now Producing at Rated Capacity. James F. Smith. *Engineering and Mining Journal*, v. 158, Jan. 1957, p. 80-85.

Layout and operation of $60-million plant with a rated capacity of 60,000 tons annually and equipped with vertical pin Soderberg anode pots of 90,000 to 100,000-amp. input.

5386 Faradaic Rectification: Theory and Application to the Hg_2^{2+}/Hg Electrode. K. B. Oldham. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 80-89.

The passage of an a.c. across an electrode in equilibrium causes a change in the electrode potential. A theoretical treatment of the effect is presented, with particular emphasis on the case of a cell consisting of two electrodes of the same metal, but of dissimilar areas, immersed in a solution containing ions of the metal.

5387 The Electrochemical Polarization of Silver Single Crystals in HCl. I. Structure Changes of (100) and (111) Faces Under Cathodic Conditions. M. Fleischmann, J. Sowerby, and H. R. Thirsk. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 91-100 + 1 plate.

The cathodic treatment, at constant potential, of Ag prior to AgCl formation was investigated. A smoothing process occurs, the extent and rate of which show maximum values with increasing negative potentials at about −500 mv. with respect to the reversible Ag/AgCl electrode in the same solution.

5388 A Study of Concentration Polarization at Working Electrodes. R. N. O'Brien and H. J. Axon. *Institute of Metal Finishing, Bulletin*, v. 6, Winter 1956, p. 41-52.

Interference fringes produced by an optical wedge system filled with aqueous electrolyte were used to study changes of optical density in an electrolyte when current is flowing.

5389 Cyclic Electrolysis. I. The Influence of Periodic Reversal of Current Upon Concentration Polarization During Metal Deposition. A. Hickling and H. P. Rothbaum. *Institute of Metal Finishing, Bulletin*, v. 6, Winter 1956, p. 53-66.

Magnitude of the effect is greatest under conditions such that diffusion away from the electrode of anodically-formed ions is minimized.

5390 (French.) Ions in Solution. Interactions and Discharges. **Les ions en solution. Interactions et décharges. I.** Electrochemical Equilibrium. **Équilibres électrochimiques.** René Audubert. 170 p. 1955. Presses Universitaires de France, Paris. (QD561 Au29i)

Equilibrium in strong or weak electrolytes; hydration of ions.

5391 Activity Coefficients in Mixed Electrolyte Solutions. William J. Argersinger, Jr. and David M. Mohilner. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 99-102.

In three-component aqueous electrolyte systems in which one solute is known to obey Harned's rule, the activity coefficient of the second electrolyte solute and the osmotic coefficient for the mixture may be directly computed without further assumptions by the integration of fundamental cross differentiation relations.

5392 Automatic Plating of Zinc Die Castings. Ernest W. Horvick. *Metal Finishing*, v. 55, Jan. 1957, p. 52B-55.

Equipment and procedures.

5393 Design and Construction of a New Plating Department. R. I. Horrocks. *Metal Finishing*, v. 55, Feb. 1957, p. 56-60.

The redesign of facilities for plating aircraft products.

5394 Chromium Plating From the Trivalent Bath. Melvin R. Zell. *Metal Finishing*, v. 55, Jan. 1957, p. 57-58.

Addition of formamide increases ductility of deposit. Operating conditions and associated problems are discussed.

5395 Nickel and Nickel Alloy Deposits. H. C. Castell. *Metal Industry*, v. 89, Dec. 28, 1956, p. 536-540.

Available plating processes and their applications; operating conditions and their influence on mechanical properties of the coatings.

5396 Alkaline Copper Plating. M. Mercadov. *Metal Industry*, v. 90, Jan. 11, 1957, p. 27-28.

How to make the utmost of alkaline Cu plating baths containing Rochelle salt.

5397* (French.) Control of the Best Electrolytic Polishing Conditions and Progress in the Investigation of New Baths. **Contrôle des conditions optima du polissage électrolytique et quelques récents progrès dans la recherche de nouveaux bains.** I. Epelboin. *Metaux, Corrosion-Industries*, v. 31, Dec. 1956, p. 475-482.

Determination of optimum electrolytic polishing techniques by use of the electron microscope. Studies of thick crystals of 99.998 Al in solutions containing ClO_4 anions. Composition and applications of some new baths.

5398 Transactions of the Institute of Metal Finishing. v. XXXII. 461 p. 1955. Institute of Metal Finishing, London. (TS670 E25j Vis.)

Contains 21 papers presented at sessions of the Institute. Subjects include barrel polishing, plating of Ni, Cr, Fe-Zn alloys, and W-Co alloys, paint and coating failures, and plating problems.

5399* (German and French.) The Effect of Maintaining at Room Temperature and Annealing on the Hydrogen Content and the Physical Properties of Electrically Deposited Metal. **Der Einfluss von Lagerung bei Raumtemperatur und von Glühen auf den Wasserstoffgehalt und die Festigkeitseigenschaften, insbesondere Dehnung und Einschnürung, von elektrisch niedergeschmolzenem Schweissgut.** Jakob Colbus. *Zeitschrift für Schweisstechnik*, v. 46, Dec. 1956, p. 277-283.

5400* (Russian.) State of a Steel Surface in Electrochemical Polishing. **Sostoianie poverkhnosti sali pri elektrokhimicheskom polirovanii.** V. L. Kheifets, N. P. Fedot'ev, and S. Ia Griliknes. *Zhurnal Prikladnoi Khimii*, v. 29, Dec. 1956, p. 1822-1827.

Analysis of current-voltage curves. Effects of current density, treatment of steel with NaOH, and duration of the electrolysis were studied.

See also: **5041** (analysis of Cr-plating solutions); **5051** (analysis of Cr-plating baths); **5255** (electrodeposition of Zr); **5296** (hard coatings for metals); **5802** (coating development in 1956); **5851** (anodic oxidation of transistion metals); **5932** (electrolytic polishing); **6184** (treatment of plating wastes).

ELECTRONICS

5401* (German.) On the Mobility of the Electrons in Non-Isothermal Argon Plasma. **Über die Beweglichkeit der Elektronen im nichtisothermen Argonplasma.** Karl Wojaczek and Karl Rademacher. *Annalen der Physik*, v. 18, Nov. 1956, p. 237-250.

A calculation, based on the Maxwell distribution of velocities, of the mobility of the electrons in a non-isothermal argon plasma as a function of an electron temperature between 10,000 and 30,000 K.

5402* (German.) Objective Spectrophotometric Investigation on the Glow Discharge. **Objektive spektralphotometrische Untersuchungen in der Glimentladung.** Fritz Schneider. *Annalen der Physik*, v. 18, Nov. 1956, p. 297-311.

With the help of a secondary electron multiplier, line intensities were measured in the glow discharge. For the strongest lines and bands of He, Ne, Hg, H_2, and O_2 gases, the number of the quanta emitted per cc. were determined as a function of the cathode distance.

5403* (Russian.) Study of Gaseous Discharge With a Strong Current in a Longitudinal Magnetic Field. **Issledovanie gazovogo razriada s bol'shoi siloi toka v prodol'nom magnitnom pole.** A. L. Bezbatchenko. I. N. Golovin, D. P. Ivanov, V. D. Kirillov, and N. A. Iavlinskii. *Atomnaia Energiia*, no. 5, 1956, p. 26-37.

A study of discharge in deuterium reaching 700 k.-amp in a longitudinal magnetic field up to 12,000 oersteds. Effect of the field on the development of the discharge.

5404* (Russian.) On the Stability of a Cylindrical Gaseous Conductor in a Magnetic Field. **Ob ustoichivosti tsilindricheskogo gazovogo provodnika v magnitnom pole.** V. D. Shafranov. *Atomnaia Energiia*, no. 5, 1956, p. 38-41.

Within the limits of hydrodynamic theory, criteria are established concerning stability in an exterior magnetic field.

5405 How an Output Transformer Causes Distortion. I. Norman H. Crowhurst. *Audio*, v. 41, Feb. 1957, p. 20-22, 75.

The different forms of distortion an output transformer can produce; some simple measurement methods. (To be continued.)

5406 High-Quality Tape-Recorder Amplifier. II. Herman Burstein and Henry C. Pollak. *Audio*, v. 41, Feb. 1957, p. 32 + 7 pages.

Adjusting; equalization; providing sufficient gain; improving signal-to-noise ratio.

5407* Transistor Audio Power-Output Stages. J. Marshall and D. Mogen. *Audio Engineering Society, Journal*, v. 4, Apr. 1956, p. 60-64.

Characteristics of the common-base, common-emitter, and common-collector circuits as related to audio work. Bias stabilization, crossover distortion, and harmonic distortion in several circuits. Basic design procedures.

5408 How to Prevent Tube Failures From Noise and Vibration. Charles B. Brahm. *Aviation Age*, v. 27, Feb. 1957, p. 82-88.

New design techniques are developed by which engineers can cut the number of such failures.

5409* (Dutch.) Printed Circuits. **Gedrukte bedradingen en schakelingen.** *Bedrijf en Techniek*, v. 11, no. 269; *Electronica section*, v. 9, Dec. 29, 1956, p. 201-203.

Advantages of printed circuits over the usual methods; applications to computers and radio.

5410* Reactive Effects in Thermistors at Very Low Frequencies. F. J. Hyde. *British Communications & Electronics*, v. 4, Jan. 1957, p. 16-17.

5411* Noise Factor and the Noise Generator in Modern Telecommunications. J. F. Golding. *British Communications & Electronics*, v. 4, Jan. 1957, p. 18-20.

Practical use of noise factor in determining receiver sensitivity. Typical designs of noise generator.

5412 The Nature of the Emitting Surface of Barium Dispenser Cathodes. I. Brodie and R. O. Jenkins. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 27-29.

The emitting surface of an "L" type cathode must be a monolayer of Ba and O in W.

5413* The Production of Higher Microwave Output Powers by Turbators. H. Paul. *Brown Boveri Review*, v. 43, Oct. 1956, p. 417-421.

Operation of magnetron producing microwave output powers of 100 watts and more. Relationship of efficiency to magnetic field induction.

5414 Properties of Gallium Indium Antimonide. J. S. Blakemore. *Canadian Journal of Physics*, v. 35, Jan. 1957, p. 91-97.

5415 Circuit Theory and Design. John L. Stewart. 480 p. 1956. John Wiley & Sons, New York. (TK3226 St49c)

Modern network theory is applied to the understanding of vacuum tubes and feedback systems. Pole-zero design methods are used extensively.

5416* Transistor Heterodyne Frequency Meter. R. W. Jones. *CQ Radio Amateurs' Journal*, v. 13, Feb. 1957, p. 28-29, 117.

Instrument uses two transistors and one Ge diode, operates continuously with battery life of 1½ to 2 yrs.

5417* Preferred Circuits. I. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 101-109.

Circuit standardization program; representative tube circuits. Two d.c. power supply regulators and a blocking oscillator frequency divider are described. (To be concluded.)

5418 Transistorized 25 Volt Regulated Power Supply. J. Giuffrida and W. O. Hamlin. *Electronic Design*, v. 5, Jan. 15, 1957, p. 28-29.

Circuit design and operation.

5419 Receiving Tube Specifications. Richard O'Fallon. *Electronic Design*, v. 5, Jan. 15, 1957, p. 30-33.

Test requirements and methods.

5420 R-F Absorbers for 50 Mc Up. Robert F. Kolar. *Electronic Design*, v. 5, Jan. 15, 1957, p. 36-37.

Measurement of reflection coefficients of materials for walls of an indoor "free-apace" room for measurements of undesired radiation from home radios and television receivers.

5421 Production Design of Compensated Attenuators. Rudolph L. Kuehn. *Electronic Design*, v. 5, Jan. 15, 1957, p. 40-43.

5422 Dimensional Control of Potted Electronic Components. Charles A. Harper. *Electronic Design*, v. 5, Jan. 15, 1957, p. 44-47.

Studies on polyester and epoxy compounds as embedment materials.

5423 A Versatile Rectangular Pulse Generator. G. O. Crowther, L. H. Light, and C. F. Hill. *Electronic Engineering*, v. 29, Jan. 1957, p. 8-12.

Instrument generates rectangular positive or negative pulses of 1μ sec. to 12 m. sec. duration, at repetition frequencies of 1 c.p.s. to 150 ke. and amplitude 0 to 100 v.

5424 Heat Control in Electronic Equipment. I. E. N. Shaw. *Electronic Engineering*, v. 29, Jan. 1957, p. 13-23 + 4 plates.

A study of natural methods of cooling compact equipment with a view to improving thermal stability and reducing component failure-rate due to overheating. (To be continued.)

5425 High Value Resistors and Their Measurement. G. France. *Electronic Engineering*, v. 29, Jan. 1957, p. 24-30.

Methods of measurement. Description of instrument enabling resistors of up to 10^{14} ohms in value to be measured at 10 v. to an accuracy of 1%.

5426 Heater Voltage Compensation for D. C. Amplifiers. J. B. Earnshaw. *Electronic Engineering*, v. 29, Jan. 1957, p. 31-35.

The concept of a fictitious voltage source to represent heater voltage fluctuations. Analysis of three compensation circuits. Experimental results and suggestions for future developments.

5427 Surface Finish and Attenuation of Aluminium Waveguides. J. Allison and F. A. Benson. *Electronic Engineering*, v. 29, Jan. 1957, p. 36-38.

5428 "Immittance". New Tool for Network Analysis. Harold M. Wasson. *Electronic Industries & Tele-Tech*, v. 16, Feb. 1957, p. 54 + 4 pages.

Two Smith Charts, reversed 180°, indicate "immittance", the combination of impedance and admittance, at a single point. Method leads to simple determination of equivalent series and shunt configurations for two-terminal networks.

5429 Pencil and Paper Calculation of Noise Level in Superheterodyne Radar Receivers. Donald W. Haney. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-3, Dec. 1956, p. 157-160. (TK1 In6.6a Vis.)

Method requires only an R.F. signal generator, a receiver with its usual nonquadratic detector, a milliammeter, and a pencil and paper.

5430 Phase Centers of Microwave Antennas. David Carter. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-4, Oct. 1956, p. 597-600. (TK1 In6.6ap Vis.)

Location of the phase centers of microwave antennas; the inadequacy of conventional aperture theory.

5431 Systematic Errors Caused by the Scanning of Antenna Arrays: Phase Shifters in the Branch Lines. L. A. Kurtz and R. S. Elliott. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-4, Oct. 1956, p. 619-627. (TK1 In6.6ap Vis.)

5432 Radiation by Disks and Conical Structures. A. Leitner and C. P. Wells. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-4, Oct. 1956, p. 637-640.

An infinite system of linear equations is used for representation of the unknown transform function in these boundary value problems.

5433 Line-of-Sight Wave Propagation in a Randomly Inhomogeneous Medium. Bob M. Fannin. *Institute of Radio Engineers, Transactions on Antennas and Propagation*, v. AP-4, Oct. 1956, p. 661-665.

5434 On the Phasing of Microphones. Benjamin B. Bauer. *Institute of Radio Engineers, Transactions on Audio*, v. AU-4, Nov.-Dec. 1956, p. 155-161. (TK1 In6.6au Vis.)

The phase-frequency characteristics of most common microphones; methods for predicting or ascertaining the phasing; a system for experimentally determining the absolute phasing of an unknown microphone.

5435 Experimental Investigation of the Transient Behavior of Gold-Germanium Surface Barriers. O. Curtis, Jr. and B. R. Gossick. *Institute of Radio Engineers, Transactions on Electron Devices*, v. ED-3, Oct. 1956, p. 163-167. (TK1 In6.6ed Vis.)

Influence of bias, current pulse duration, and barrier characistics.

5436 On the Shannon Theory of Information Transmission in the Case of Continuous Signals. Andrei N. Kolmogorov. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-2, Dec. 1956, p. 102-108. (TK1 In6.6it Vis.)

5437 On Noise Stability of a System With Error-Correcting Codes. Vladimir I. Siforov. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-2, Dec. 1956, p. 109-115. (TK1 In6.6it Vis.)

5438 A Note on the Maximum Flow Through a Network. P. Elias, A. Feinstein, and C. E. Shannon. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-2, Dec. 1956, p. 117-119. (TK1 In6.6it Vis.)

Develops the theorem; the maximum possible flow from left to right through a network is equal to the minimum value among all simple cut-sets.

5439 Rectification of Two Signals in Random Noise. L. Lorne Campbell. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-2, Dec. 1956, p. 119-124. (TK1 In6.6it Vis.)

The spectrum of the output of a half-wave rectifier is derived for an input which is the sum of random noise and two sinusoidal signals of different frequencies.

5440 Optimum Detection of Random Signals in Noise, With Application to Scatter-Multipath Communication. I. Robert Price. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-2, Dec. 1956, p. 125-135. (TK1 In6.6it Vis.)

Solutions are obtained in open form for the optimum, probability-computing detector.

5441 Calculations of the Risk of Component Applications in Electronic Systems. John A. Connor. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-9, Jan. 1957, p. 30-44. (TK1 In6.6q Contin.)

Outlines a practical (budgeted) program of reliability analysis with some selected examples of those grass-root problems of prime interest.

5442 White-Noise Vibration Test for Electronic Tubes. John D. Robbins. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-9, Jan. 1957, p. 86-92. (TK1 In6.6q Contin.)

Equipment and specification controls permitting the vibrational testing of vacuum tubes over a range of the audio frequency spectrum.

5443 Environmental Effects on Vacuum-Tube Life. H. C. Pleak and A. V. Baldwin. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-9, Jan. 1957, p. 93-101. (TK1 In6.6q Contin.)

Overworking of the tube is also considered.

5444 A New 300 Watt Stacked Ceramic Tetrode of High Reliability. Willis B. Foote. *Institute of Radio Engineers, Transactions on Reliability and Quality Control*, PGRQC-9, Jan. 1957, p. 113-125. (TK1 In6.6q Contin.)

History and design of the 4CX300A tube.

5445* (Russian.) Modern Semiconductor Materials. **Sovremennye poluprovodnikovye materialy.** D. A. Petrov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 11, Nov. 1956, p. 82-95.

New possibilities in electronics and radio offered by the development of crystal semi-conductive rectifier and amplifier. Metals and methods used; problems.

5446* (Russian.) Studying the Emission Characteristics of Oxide Cathodes Using New Nickel Alloys as a Base Metal. **Issledovanie emissionnykh svoistv oksidnykh katodov s kernami iz novykh nikelevykh splavov.** V. S. Parkhomenko, M. A. Chistiakova, G. A. Vostrov, and G. M. Kudriasheva. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 20, Oct. 1956, p. 1112-1119.

A study of the effects of the base metal of the cathode sleeve on the emission characteristics of oxide-coated cathodes in vacuum tubes. Studies were made on Ni-Ca, Ni-Sr, Ni-W base metal made into sleeves of various diameters. These three alloys are superior to the metals used at present. Ni-W is recommended for high-reliability tubes.

5447 Effect of Structural Defects in Germanium on the Diffusion and Acceptor Behavior of Copper. C. S. Fuller and J. A. Ditzenberger. *Journal of Applied Physics*, v. 28, Jan. 1957, p. 40-48.

It appears that Cu atoms enter Ge interstitially at a high rate, but that their flow and ultimate concentration is limited by the effective rate of generation and equilibrium concentration of vacancies chiefly at dislocations.

5448 Influence of a Ridge on the Low-Frequency Ground Wave. James R. Wait and Anabeth Murphy. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 1-5.

A solution to the problem of a plane wave incident on a semi-elliptical boss on an otherwise perfectly conducting flat ground plane is obtained in terms of elliptic wave functions.

5449 Cathode-Ray Irradiation of Cellophanes. M. Karel and B. E. Proctor. *Modern Packaging*, v. 30, Jan. 1957, p. 141 + 8 pages.

Irradiation applied at doses in excess of 3.5×10^6 rep. causes deterioration of the moistureproof qualities of cellophanes, especially when the films are in contact with moisture and when subsequent storage is at medium or high humidities. This is attributed to chemical decomposition of the coating. Investigation of an unpleasant taste acquired by distilled water irradiated in cellophane bags indicates that irradiation increases transference of optically active compounds from the cellophane into the water. Optical properties and pH were determined for irradiated glycerol and irradiated ethylene glycol solutions. Work is now in progress to find coating compositions suitable for irradiation processing.

5450 Scattering by a Small Conducting Prolate Spheroid. Raymond Justice. *Ohio State University Research Foundation Report No. 678-2, for Air Force Cambridge Research Center, Contract No.* AF 19(604)-1725, Aug. 1956, 79 p. (TK6565.W3 Oh3.6r Contin.)

Problems involved in obtaining the scattered field terms include finding solutions to various vector differential equations and Laplace's equation, and examining in detail the behavior at infinity of various terms in the series.

5451 A Study of an Open Rectangular Waveguide Partly Filled With a Stratified Dielectric. R. I. Barnett, Jr. and C. T. Tai. *Ohio State University Research Foundation Report No. 678-1, for Air Force Cambridge Research Center, Contract No.* AF 19(604)-1725, Sept. 1956, 9 p. (TK6565.W3 Oh3.6r Contin.)

Main emphasis is on determination of the phase velocity of the guided wave which is being propagated in the guide.

5452 Theory of Photoconductivity in Semiconductor Films. Richard L. Petritz. *Physical Review*, v. 104, ser. 2, Dec. 15, 1956, p. 1508-1516.

Equations are developed for the response to radiation, noise, and limit of sensitivity of the detector.

5453 Electrical Properties of *n*-Type InAs. T. C. Harman, H. L. Goering, and A. C. Beer. *Physical Review*, v. 104, ser. 2, Dec. 15, 1956, p. 1562-1564.

Hall coefficient and resistivity were measured as functions of temperature. A room temperature mobility of 30,000 sq. cm. per v. sec. was obtained for a donor concentration of 1.7×10^{16} atoms per cc. For this impurity density, no indication of a separation of the donor level from the conduction band was observed.

5454 Microwave Conductivity of an Ionized Decaying Plasma at Low Pressures. Aldo L. Gilardini and Sanborn C. Brown. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 25-30.

Margenau's analysis for the microwave conductivity of an infinite decaying plasma in a uniform field is extended to the case of a bounded plasma in a slightly nonuniform field.

5455 Triple Acceptors in Germanium. H. H. Woodbury and W. W. Tyler. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 84-92.

Both Cu and Au introduce three acceptor levels in the forbidden band of Ge.

5456 Spontaneous Radiative Recombination in Semiconductors. William P. Dumke. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 139-144.

Expressions are derived for the radiative recombination lifetimes due to direct and indirect transitions and are applied to Ge and Si.

5457 Anisotropic Galvanomagnetic Effects in Semiconductors. J. R. Drabble and R. Wolfe. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1101-1108.

Explicit expressions for the components of the conductivity, Hall conductivity, and magnetoconductivity tensors are derived for a six-valley model in which the energy extrema lie on the reflection planes in k-space.

5458 Volume Generated Currents and Secondary Effects in Amorphous Selenium Films. W. E. Spear. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1139-1147.

Charge carriers are generated in amorphous Se films by electron bombardment. Resulting current is studied in relation to average depth of penetration of the bombarding beam, confirming the exceptionally large effective mobility of positive holes.

5459 A Pulse Method for Measurement of Hall Coefficient at Low Temperatures: Some Results on Indium Antimonide. R. F. Broom and A. C. Rose-Innes. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1269-1275.

Measurements were made over the range 90 to 1.4 K on several p-type samples of different impurity concentration.

5460 Progress in Semiconductors. Alan F. Gibson, R. E. Burgess, and P. Aigrain, editors. v. I. 220 p. 1956. Heywood & Co., London. (TK3376 P94 Vis.)

Critical review articles on advances in Si, Ge filament, Seebeck effect, electrical properties of phosphors, H.F. transistors, photomagnetoelectric effect, and field effect.

5461 Portable TV Pattern Generator. II. Earl T. Hansen. *Radio-Electronics*, v. 28, Feb. 1957, p. 54-56.

Construction details offer solutions to electronic and mechanical problems. (To be continued.)

5462* (Russian.) Results of Studies on the Energy Distribution of Photoelectrons From an Antimony-Cesium Cathode. **Nekotorye rezul'taty issledovaniia raspredeleniia fotoelektronov po energiiam iz sur'miano-tsezievogo katoda.** N. M. Politova. *Radiotekhnika*, v. 1, Oct. 1956, p. 1325-1333.

A study of curves of photoelectron distribution according to the energy of various wavelengths of light (4000 to 6300 Å) striking the cathode.

5463 Radio Telemetry. Myron H. Nichols and Lawrence L. Rauch. 2nd Ed. 461 p. 1956. John Wiley & Sons, New York. (TK399 N51r)

Practical and theoretical considerations involved in the design and development of new equipment and utilization of available equipment. Includes a thorough background in environmental errors and inherent errors, frequency and time domain analysis, modulation and multiplexing, minimum signal strengths and thresholds, sampled data smoothing, and interpolation.

5464 A Portable Thyratron Tester. W. Philbrook. *Radio & Television News*, v. 57, Feb. 1957, p. 46-48.

Commercially available instrument uses several unique circuits to test specialized tube types.

5465 Periodic Sampling Logarithmic Amplifier. Stephen J. Nettel. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 37-40.

Logarithmic response is derived by extracting an output proportional to the time required for the voltage across a parallel resistance condenser combination to decay to a small fixed value.

5466* Camera Tubes for Color Television Broadcast Service. R. G. Neuhauser. *Society of Motion Picture and Television Engineers, Journal*, v. 65, Dec. 1956, p. 636-642.

Review of tubes currently used and tubes basically unsuitable for color TV. General tube requirements. Performance characteristics of vidicons and image orthicons. Quality problems encountered in color pickup.

5467 (German.) Vacuum Tube Amplifier in Electronic Measurement. **Der Kathodenverstärker in der elektronischen Messtechnik.** Kurt Müller-Lübeck. 155 p. 1956. Springer-Verlag, Berlin. (TK7882.M4 M88k)

Application of vacuum tubes in measurements in high and middle frequencies as well as in the field of physics, chemistry, and general electrotechnics.

5468* Limiters and Discriminators for F. M. Receivers. I. Wide or Narrow Bandwidth; Basic Equivalent Circuits; The Round-Travis Discriminator. II. Foster-Seeley Discriminator: Designing for Minimum Distortion. G. G. Johnstone. *Wireless World*, v. 63, Jan. 1957, p. 8-14; Feb. 1957, p. 70-74.

Design of circuits; performance data.

5469* Output Transformerless Amplifiers. *Wireless World*, v. 63, Feb. 1957, p. 58-62.

A general review.

See also: **4795** (doppler radar navigation system); **5328** (transistors in computers); **5338** (crystal photocell circuits); **5350** (reliability of circuits); **5656** (electronics abstracts services); **5679** (optical instruments for semiconductor research); **5685** (electrostatic lens); **5712** (packaging costs); **5884** (Hall coefficient of Cu, Ag, and Au).

ENGINEERING ECONOMICS

5470 Gas and Total Energy Demands in 1975. *American Gas Association Monthly*, v. 39, Jan. 1957, p. 16 + 5 pages.

Total annual demands of the nation for natural gas will be 22½ trillion cu. ft. by 1975.

5471* Gas Utilities Look Toward 1957 With Enthusiasm and Optimism. C. H. Zachry. *American Gas Journal*, v. 184, Jan. 1957, p. 20-23.

Statistical gains in 1956 and prospects for 1957.

5472* **Aerosol Economics.** Harry E. Peterson. *American Perfumer and Aromatics*, v. 69, Jan. 1957, p. 62, 64, 68.

Past, present, and future market data; capital investment. Advantages of contract packaging.

5473* **Annual Capacities of Coke Ovens, Blast Furnaces and Steelmaking Furnaces as of January 1, 1957, by Companies, States and Districts (United States and Canada).** 26 p. American Iron and Steel Institute, New York. (TN704 Am35a)

5474 **A Basis for Forecasting Nickel Demand in the United States.** Henry D. Lytton. 81 p. 1956. Henry D. Lytton, New York. (HD9539.N52 L99b Over.)

A formula for normal Ni demand is proposed as an aid in relating peace time Ni consumption to general business conditions and in developing more specific sales quotas by markets.

5475 **The New Industrial Revolution.** George Thomson. *Bulletin of the Atomic Scientists*, v. 13, Jan. 1957, p. 9-12.

The human mind, each with its own unique thought patterns and sense of values in the non-scientific fields such as religion, politics, and human relations, which is established usually somewhere between 20 and 30 years of age, presents the greatest challenge to our fruitful, beneficial realization of the powers we now command or foresee. Despite the fact that relationship between science and technology, as represented historically by ideas and their material consequences, has very nearly reached the state of inseparability, the development of the human mind and the length of human life is not speeded up. As a consequence, when man attains his greatest power in his fifties or even later, if the circumstances have changed or his objectives are not morally compatible, his ideas will be old-fashioned and will not conform well to reality. Given time, difficulties will sort themselves out, provided that the circumstances are not changing and producing fresh ones, for after all the four requirements of this new age: power, food, materials, and skilled direction, show no insurmountable obstacles, but do produce some problems.

5476 **Power and Population, Canada's Present Electricity Requirements and the Long-Term Outlook.** C. E. Baltzer and John Convey. *Canada, Department of Mines and Technical Surveys, Mines Branch Memorandum Series No.* 133, 1956, 25 p. (TN26 C16.5m Vis.)

5477* **Business Forecast.** L. G. Nicol. *Canadian Business*, v. 30, Jan. 1957, p. 17 + 7 pages.

Canadian economists predict for 1957 an 8% increase in gross national product.

5478* **Navigation, Flood Control, Power—TVA Develops Its Rivers.** Reed A. Elliot. *Civil Engineering*, v. 27, Jan. 1957, p. 46-49.

5479* **The Electric Industry in 1956 and Beyond.** Donald S. Kennedy. *Edison Electric Institute Bulletin*, v. 24, Dec. 1956, p. 391-394.

Data are graphed. All indications point to a continuation of the ever-increasing demands for power by industry, business, and the residential consumer in 1957.

5480* **EEI Documents Utility Progress in 1956.** Donald S. Kennedy. *Electric Light and Power*, v. 35, Jan. 15, 1957, p. 68-72.

An authoritative analysis of the electric utility industry's accomplishments and prospects.

5481* **Are We Running Out of Oil?** *Guaranty Survey*, v. 36, Feb. 1957, p. 1-4.

Oil supplies seem adequate if a program of constant development is maintained.

5482 **The Application of Consumer Research to the Gas Industry.** H. R. Hart. *Institution of Gas Engineers, Copyright Publication*, no. 497, 1956, 28 p. (TP700 In7.3c Vis.)

Methods; application to particular situations; associated problems.

5483 **Developments in the Iron and Steel Industry During 1956.** I. E. Madsen. *Iron and Steel Engineer*, v. 34, Jan. 1957, p. 119-169.

All phases of the industry are reviewed.

5484* **Presentation of Special Reports.** John W. Queenan. *Journal of Accountancy*, v. 103, Feb. 1957, p. 34-40.

Some points for the accountant to consider in reports dealing with nonprofit organizations, cash-basis statements, segments of the usual financial statements, or compliance with legal documents.

5485 **MAPI Replacement Manual for the Attainment of a Dynamic Equipment Policy.** 78 p. 1950. Machinery & Allied Products Institute, Chicago. (TS155 M18m)

Some broader aspects of equipment-purchasing policies. Detailed application of the MAPI procedure for replacement analysis.

5486* **Metal Statistics, 1946-1955.** 43rd Ed. 219 p. 1956. Metallgesellschaft Aktiengesellischaft, Frankfurt. (AD9506 M56s)

World statistics on production and consumption of Al, Pb, Cu, Zn, Sn, Cd, Mg, Ni, Hg, and Ag.

5487 **The Year in Fourth District Banking.** *Monthly Business Review*, Jan. 1957, p. 2-6.

A report on the 1956 financial status of the Fourth Federal Reserve District.

5488 **Nickel Demand for 1956: A Forecast of the Market for an Industrial Material.** Henry D. Lytton. 20 p. 1956. Henry D. Lytton, New York. (HD9539.N52 L99n Over.)

Statistical research and analysis of consumption patterns and corresponding indicators show that industrial demand for Ni in the U.S. is highly correlated with the demand for alloy steel and durable goods.

5489 **What You Should Know About Evaluating an Oil Property. II.** E. A. Polumbus, Jr. *Oil and Gas Journal*, v. 55, Feb. 11, 1957, p. 111-115.

Oil reserves, participation, value of oil, and operational expenses are all part of the total picture.

5490 **Proceedings—Industrial Economics Conference.** 102 p. 1956. Stanford Research Institute, Menlo Park, Calif. (HD31 St24p)

Development planning for various industries.

5491 **Resources for the Future. Annual Report for the Year Ending September 30, 1956.** 85 p. Resources for the Future, Inc., Washington, D. C. (Pamphlet)

Land use and management; national growth; water, energy, and mineral resources.

5492* **Growth Trends in the Rubber Industry.** W. J. Sears. *Rubber World*, v. 135, Jan. 1957, p. 553-558.

U. S. synthetic rubber production capacity in 1960 is estimated at about 1.8 million long tons. This figure is in excess of estimated consumption of both natural and synthetic rubbers, but will provide tonnage for the growing export market for synthetic rubber.

5493* **Current Economic Developments in Europe.** *United Nations Economic Bulletin for Europe*, v. 8, no. 3, 1956, p. 1-44.

5494* **Water Supply Progress in 1956.** Fred Merryfield. *Water & Sewage Works*, v. 104, Jan. 1957, p. 1-13.

A review of developments and trends.

5495 **How to S-t-r-e-t-c-h Your Power Dollar.** Luther W. Davis. *World Oil*, v. 144, Feb. 1957, p. 49-51.

The 'art' of purchasing power involves studying operations and securing billing at best available rates. Case histories reveal oil company savings of as much as 12% in power costs.

See also: **4989** (costs of cation-exchange equipment); **5599** (costs of oil well drilling); **5909** (economics of Ti fabrication); **6066** (allocation of sales effort).

FLUID MECHANICS

5496* **Designating Flow Restrictors.** D. M. Bruce and K. G. Hancock. *Applied Hydraulics*, v. 10, Feb. 1957, p. 88, 90, 92, 94.

A system which overcomes the difficulty of using drill numbers to designate the size of restrictors.

5497 The Flow of Gas Through Composite Systems at Very Low Pressures. C. W. Oatley. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 15-19.

An improved method of calculation.

5498* (Russian.) Approximate Formulas for Calculation of Shock Wave Front Characteristics From a Point-Source Blast in Gas. **Priblizhennye formuly dlia rascheta kharakteristik fronta udarnoi volny pri tochechnom vzryve v gaze.** V. P. Korbdeinikov. *Doklady Akademii Nauk SSSR*, v. 111, Nov. 21, 1956, p. 557-559.

Simple approximate adiabatic formulas for the cases of spherical, cylindrical, and plane waves.

5499* (Russian.) New Solution of Hydrodynamic Equations. **Novoe reshenie uravnenii gidrodinamiki.** L. V. Ovsiannikov. *Doklady Akademii Nauk SSSR*, v. 111, Nov.-Dec. 1956, p. 47-49.

Gives exact-quotient solution of equation for adiabatic motion in compressed fluids.

5500 Absorption of Gases in Liquid Jets. E. J. Cullen and J. F. Davidson. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 113-120 + 1 plate.

The rate of absorption of CO_2 into a jet of water was measured and compared with the calculated theoretical value.

5501 Heat-Transfer Studies. Vertical Free Convection From an Isothermal Surface. J. T. Bevans. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 114-119.

Obstruction of free convection along the side of a vertical surface extends upstream to a critical Grashoff and Prandtl moduli product.

5502 Isokinetic Sampling Probes. Richard Dennis, William R. Samples, David M. Anderson, and Leslie Silverman. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 294-302.

Aerodynamic characteristics of five probes for sampling gas streams.

5503 Variable Area Flow Meters. M. C. Coleman. *Institution of Chemical Engineers, Transactions*, v. 34, no. 4, 1956, p. 339-350.

Shows how compensation for changes in density of the fluid being metered can be obtained by making the float density twice the mean fluid density. It is shown how float shape influences both the flow coefficient and the effect of viscosity.

5504 Short Methods for Calculating Fluid Flow. Dale Kelly. *Instruments and Automation*, v. 30, Jan. 1957, p. 74-77.

A short-cut method for calculating flow within 1% accuracy for conventional flow elements.

5505 (German.) Investigations on Tridimensional Potential Flow Through Axial Cascades. **Untersuchungen über die Dreidimensionale Potentialströmung durch Axiale Schaufelgitter.** Theo Ginsburg. 79 p. 1956, Verlag Leemann, Zurich. (TL570 In8m Vis.)

The problem of flow of an angular vortex between 2 coaxial cylinders is divided in two parts: a mathematical solution of the problem in the vicinity of the radial member vortex; analog measurements in electrolytic and two-dimensional tanks.

5506* (Russian.) Sedimentation Theory. Motion of Heavy Particles in Turbulent Flow. **K teorii nanosov. O dvizhenii tiazheloi chastitsy v turbulentnom potoke.** M. D. Khaskind. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 11, Nov. 1956, p. 28-39.

A theoretical study of the forces of flow acting on the particles. Slow pulsations of a turbulent flow; pulsations of a H.F. turbulent flow; forward motion of the particles according to the law of resistance.

5507 Curved Fluid Interfaces. II. The Generalized Neumann Formula. Frank P. Buff and Howard Saltsburg. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 23-31.

5508 Resistance of Flow in Teflon and Brass Tubes. Marion R. Brockman. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 51-60.

No slip flow exists for water flowing through Teflon tubing.

5509 Momentum Transfer in Fluids. Wm. H. Corcoran, J. B. Opfell, and B. H. Sage. 394 p. 1956. Academic Press, New York. (QC151 C81m)

Covers laminar and turbulent shear-flow, boundary-layer analysis, and a statistical treatment of turbulence. Conditions of flow frequently encountered in industrial chemical plants.

5510 Derivation of Flow Equation for Liquids. John M. Campbell. *Oil and Gas Journal*, v. 55, Feb. 4, 1957, p. 125-127.

5511* Calculating Three-Phase Flow in Horizontal Pipe Lines. D. P. Sobocinski and R. L. Huntington. *Pipe Line Industry*, v. 6, Jan. 1957, p. 43-45.

Tests covering a wide range of flow rates provide valuable pressure drop data for these complex systems.

5512* On Laminar Flow Through a Channel or Tube With Injection: Application of Method of Averages. Morris Morduchow. *Quarterly of Applied Mathematics*, v. 14, Jan. 1957, p. 361-368.

A simple approximate closed-form solution for the flow through a channel and through a circular tube with porous walls valid for the entire range of normal fluid injection velocities from zero to indefinitely large.

5513* (French.) Separation Point of Three-Dimensional Laminar Flow. **Séparation de l'écoulement laminaire tridimensionnel.** Robert Legendre. *Recherche Aéronautique*, no. 54, Nov.-Dec. 1956, p. 3-8.

On the basis of regularity combined with the property of null divergence of the flux vector, the nature of the singularities that appear in the flow and on the surface of an obstacle are characterized. There is no singular separation line clearly distinguished from the neighboring wall flow line.

5514 Heat Transfer at Small Grashof Numbers. J. J. Mahony. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 412-423.

5515 Oblique-Shock Relations at Hypersonic Speeds for Air in Chemical Equilibrium. W. E. Moeckel. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3895, Jan. 1957, 18 p. (TL570 Un3C)

Those shock parameters which are functions only of Mach number normal to the shock for an ideal gas are strongly influenced by flight altitude, as well as normal Mach number, when dissociation takes place.

5516 A Theoretical and Experimental Study of the Shock Tube. I. I. Glass, W. Martin, and G. N. Patterson. *University of Toronto, Institute of Aerophysics, UTIA Report. No.* 2, Nov. 1953, 281 p. (TL570 T64.84a Vis.)

Comprehensive graphs for determination of wave speeds and physical quantities of uniform states. Experiments on the emergence from shock tube of shock and rarefaction waves, condensation effects, wave refraction, collision of shock waves and wire screens, and overtaking of two shock waves.

5517 Unsteady State Flow in Gas Reservoirs. David Cornell. *World Oil*, v. 144, Feb. 1957, p. 133-134.

Procedure by which flow problems, such as normally occur in field production or in back pressure testing of gas wells, may be solved using the Van Everdingen and Hurst solutions for unsteady state flow.

5518 Gas Jet Compressors Are Arousing Interest. Frank H. Dotterweich and C. V. Mooney. *World Oil*, v. 144, Feb. 1957, p. 136, 139-141.

Producers are taking a closer look at this ingenious device as a means of putting low pressure gas into intermediate pressure lines.

5519 Analysis of Laminar Heat Transfer in Wedge-Shaped Passages. E. R. G. Eckert, T. F. Irving, Jr., and J. T. Yen. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 56-98, Apr. 1956, 53 p. (TL507 Un3.18w Vis.)

See also: **6118** (rheology studies).

FOOD TECHNOLOGY

5520 (English.) **Experiments on the Culture of Chlorella for Food Purposes.** Lars Björkman, Monica Björkman, Arne Bresky, Lennart Enebo, and Jan Rennerfelt. *Acta Polytechnica (Chemistry Including Metallurgy Series)*, v. 4, no. 10, 1955, 18 p. (T1 Ac81 Vis.)

Indoor and outdoor cultures of *Chlorella pyrenoidosa* were carried out to study the influence of various factors on the rate of growth.

5521* **Radiation Processing of Foods.** R. H. Wasserman. *American Dietetic Association, Journal*, v. 33, Jan. 1957, p. 33-36.

The present status of radiation processing is summarized from the viewpoints of motivation, acceptability, nutritional aspects, and future outlook.

5522 Antioxidant Properties of Tomato Lipids. R. E. Henze and F. W. Quackenbush. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 1-4.

Primary antioxidant activity was accountable in the tocopherol content of the tomato extracts. Synergistic activity was qualitatively similar to phosphoric acid, and the synergistic fraction was found to contain 2.4% P.

5523 A Modern Reflectometer for Flour and Near-White Substances. D. W. Kent-Jones, A. J. Amos, W. Martin, R. A. Scott, and D. G. Elias. *Chemistry & Industry*, Dec. 22, 1956, p. 1490-1493.

Design, operation, and standardization of instrument for determining flour grade.

5524 How Irish Moss Extractive Improves Protein-Content Foods. Elmer F. Glabe, Pauline F. Goldman, and Perry W. Anderson. *Food Engineering*, v. 29, Jan. 1957, p. 65-67.

Uses are seen multiplying following striking success in extending mixing tolerances of bread doughs, firming spaghetti, enhancing white cakes, protecting bean hulls, suspending cocoa in chocolate milk, and producing dry icings.

5525* **The Effect of Copper Contamination Upon the Development of Color in the Processing and Storage of Honey.** E. Einset and Walter L. Clark. *Food Technology*, v. 11, Jan. 1957, p. 12-14.

5526* **Effect of Tomato Cell Structures on Consistency of Tomato Juice.** R. T. Whittenberger and G. C. Nutting. *Food Technology*, v. 11, Jan. 1957, p. 19-22.

Consistency depends largely on the quantity, shape, and degree of subdivision of the cell walls present, and on the character of the walls as determined by the occurrence of pectins.

5527* **The Time-Temperature Tolerance of Frozen Foods. I. Introduction—The Problem and the Attack.** W. B. Van Arsdel. **II. Retail Packages of Frozen Peaches.** D. G. Guadagni, C. C. Nimmo, and Eugene F. Jansen. **III. Effectiveness of Vacuum, Oxygen Removal, and Mild Heat in Controlling Browning in Frozen Peaches.** D. G. Guadagni and C. C. Nimmo. **IV. Objective Tests to Measure Adverse Changes in Frozen Vegetables.** W. C. Dietrich, F. E. Lindquist, J. C. Miers, G. S. Bohart, H. J. Neumann, and W. F. Talburt. *Food Technology*, v. 11, Jan. 1957, p. 28-47; Feb. 1957, p. 109-113.

5528* **The "COF Effect" in Frozen Citrus Products.** J. S. Blair, Edith M. Godar, H. G. Reinke, and J. R. Marshall. *Food Technology*, v. 11, Feb. 1957, p. 61-68.

This "citrus-oxidized flavor" effect is a "tallowy" mouth-feel or a "cardboard" or "castor-oil-like" malodor, appearing during the frozen storage of citrus products. Physiological immaturity is suggested as the causative factor.

5529* **Changes in the Water-Holding Capacity and Cationic Shifts During the Heating and Freezing and Thawing of Meat as Revealed by a Simple Centrifugal Method for Measuring Shrinkage.** Eugen Wierbicki, L. E. Kunkle, and F. E. Deatherage. *Food Technology*, v. 11, Feb. 1957, p. 69-73.

5530* **Effects of Added Sodium Chloride, Potassium Chloride, Calcium Chloride, Magnesium Chloride, and Citric Acid on Meat Shrinkage at 70°C. and of Added Sodium Chloride on Drip Losses After Freezing and Thawing.** Eugen Wierbicki, V. R. Cahill, and F. E. Deatherage. *Food Technology*, v. 11, Feb. 1957, p. 74-76.

5531* **Thermal Destruction Rates of Thiamine in Pureed Meats and Vegetables.** E. Feliciotti and W. B. Esselen. *Food Technology*, v. 11, Feb. 1957, p. 77-84.

The rate in aqueous solution, phosphate buffered solutions, and selected low-acid foods was studied over the temperature range of 228 to 300 F.

5532* **Role of Reducing Sugars and Amino Acids in the Browning of Potato Chips.** Ahmed T. Habib and H. D. Brown. *Food Technology*, v. 11, Feb. 1957, p. 85-89.

Low basic amino acids and low reducing sugars are associated with light colored chips.

5533* **Nutritive Value of the Proteins of Stored Instant Nonfat Dry Milk.** A. Z. Hodson and C. B. Miller. *Food Technology*, v. 11, Feb. 1957, p. 89-92.

The lysine contents and protein efficiencies of pasteurized milk and of properly stored instant nonfat dry milks are satisfactory.

5534* **Stability of Frozen Concentrated Orange Juice. III. The Effect of Heat Treatment in the Production of High-Brix Frozen Concentrate.** Owen W. Bissett, M. K. Veldhuis, R. B. Guyer, and W. M. Miller. *Food Technology*, v. 11, Feb. 1957, p. 96-99.

Cloud stabilities of 58.5° Brix samples were superior to those of corresponding 42° Brix samples when stored at 40 F.

5535* **Effect of Reducing Agents on Cured Meat Color.** George G. Kelley and Betty M. Watts. *Food Technology*, v. 11, Feb. 1957, p. 114-116.

The effectiveness of cysteine, ascorbic acid, and glutathione on a weight basis is inversely proportional to the mol. wt.

5536* **Detection of Free Radicals in Irradiated Food Constituents by Electron Paramagnetic Resonance.** John P. O'Meara and Thomas M. Shaw. *Food Technology*, v. 11, Feb. 1957, p. 132-136.

Electron paramagnetic resonance techniques can be used for the *in situ* detection of free radicals in irradiated substances.

5537 Directed Interesterification of Lard. Chester Placek and George W. Holman. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 162-169.

Production operations used for a lard with all the desirable properties of vegetable shortening.

5538 Factorial Experiments Help to Improve Your Food. W. J. Youden. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 85A-86A.

Use of statistical design in selecting processing factors.

5539 Selection of a Food Irradiation Reactor Type. Phase I. *Internuclear Company, Inc. (U. S. Atomic Energy Commission)*, AECU-3319, July 1956, 72 p. (UF767 U3au Contin.)

The most feasible is a heterogeneous MTR-type fully enriched light water moderated and cooled reactor core surrounded by a blanket containing a liquid with a specific γ producer in a separate loop from the core coolant.

5540 Flavor of Selected Vegetables Grown in Pesticide-Contaminated Soils. Gladys L. Gilpin, Albert B. Parks, and Howard Reynolds. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 44-48.

5541 Lines of Attack on Dough Chemistry. Isydore Hlynka and J. A. Anderson. *Journal of Agricultural and Food Chemistry*, v. 5, Jan. 1957, p. 56-59.

Test baking, dough rheology, and analytical chemical procedures can supplement one another in research on dough chemistry, though the first still provides the main criterion of flour quality. Newer developments in dough rheology include description of dough properties by means of structural relaxation curves and relaxation time spectra.

5542 Tables of Food Values. Alice V. Bradley. Rev. Ed. 232 p. 1956. Chas. A. Bennett Co., Peoria. (TP372 B72t)

Diet components and calculations; menu planning; food value of average servings and 100-gram portions.

FUELS AND COMBUSTION

5543* Gasification. R. A. Glenn. *Bituminous Coal Research*, v. 16, no. 4, Winter 1956, p. 8-11.

Types of coal gases and their uses; production and consumption data.

5544 The Size of Solid Fuel in Relation to the Behaviour of Combustion and Gasification Appliances. J. R. Arthur and W. D. Smith. *British Coal Utilisation Research Association, Monthly Bulletin*, v. 20, Nov. 1956, p. 429-444.

5545* (French.) Comparison of Ultraviolet Spectra From a Methane Flame in the Air and From a Catalytic Combustion on Platinum Filament at High Temperature. **Émissions ultraviolettes comparées d'un mélange air-méthane en combustion de flamme et en combustion catalytique sur filament de platine à haute température.** Charles Eyraud, Paul Bussière, and Barthélémy Domanski. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1604-1607.

Study of these spectra shows that the light energy produced by the catalyzed chemical reaction shares principally in the thermal emission of the filament instead of giving characteristic bands similar to those of the flame.

5546 Flammability Limits for Hydrocarbons at Low Pressures. Paul B. Stewart and E. S. Starkman. *Chemical Engineering Progress*, v. 53, Jan. 1957, p. 41J-45J.

Spark ignition test results are given as graphs showing regions where flammable and nonflammable mixtures exist.

5547* Fluid Coke Burns Satisfactorily. Darcy Curwen. *Electrical World*, v. 147, Jan. 28, 1957, p. 112-114, 236.

Refinery by-product proves to be practical fuel in utility-size boilers although only limited use of it is foreseen.

5548 Role of Hydrogen Bonds in the Briquetting of Lignite. M. S. Iyengar, D. N. Sibal, and A. Lahiri. *Fuel*, v. 36, Jan. 1957, p. 76-84.

The influence of polar and non-polar liquids and of acetylation and barium acetate treatment on the briquetting properties of Indian lignites show that H bonding is an important factor.

5549 Chemical Structure and Properties of Coal. XVII. A Mathematical Model of Coal Pyrolysis. H. A. G. Chermin and D. W. van Krevelen. *Fuel*, v. 36, Jan. 1957, p. 85-104.

Proposed model is based on the consecutive reaction theory and permits satisfactory explanation of the degasification and the plastic behavior of coking coal.

5550 Effect of Particle Size on Combustion of Uniform Suspensions. J. A. Browning, T. L. Tyler, and W. G. Krall. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 142-147.

Determination of the lean limit of flammability and the maximum pressure rise of nearly monodisperse clouds of Armowax particles in air.

5551 Rate of the Steam-Carbon Reaction by a Falling-Particle Method. James A. Dotson, John H. Holden, and Walter A. Koehler. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 148-154.

Obtained kinetic data under the following conditions: temperature range 1800 to 2500 F, carbon particle size 200- to 230-mesh, and sufficient excess of steam so that the change in the gas composition was negligible.

5552 Photographic Studies of Turbulent Flame Structure. Joseph Grumer, Joseph M. Singer, J. Kenneth Richmond, and James R. Oxendine. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 305-312.

Photographic evidence is non-supporting and contradictory to both the wrinkled, fluctuating laminar wave and continuous reaction zone concepts of turbulent burning, but is compatible with the concept of discontinuous flamelets.

5553* Methane and Its Combustion. Alfred Egerton. *Institute of Fuel, Journal*, v. 30, Jan. 1957, p. 3-12 + 1 plate.

Limits of inflammability; combustion experiments; methane as a fuel; direct synthesis; production by the hydrogenation reaction.

5554* Coal Breakage Processes. III. The Analysis of a Coal Transport System. S. R. Broadbent, T. G. Callcott, and W. Scott. **IV. An Exploratory Analysis of the Cone Mill in Open-Circuit Grinding.** S. R. Broadbent and T. G. Callcott. *Institute of Fuel, Journal*, v. 30, Jan. 1957, p. 13-25 + 3 plates.

5555* Experimental Studies on a Cyclone Chamber for Combustion and Gasification of Heavy Liquid Fuels. H. A. Havemann and K. Mahadevan. *Institute of Fuel, Journal*, v. 30, Jan. 1957, p. 26-39 + 3 plates.

Design features for an air weight flow of ¼ lb. per sec. Experimental results obtained with different types of secondary-zone fuel injection systems for light diesel oil and preheated bunker oil. Nearly complete combustion of fuel particles is achieved irrespective of the type of liquid fuel even when the air/fuel ratio is stoichiometric.

5556 Coal Science and the Gas Industry. D. T. A. Townend. *Institution of Gas Engineers, Copyright Publication*, no. 494, 1956, 40 p. (TP700 In7.3c Vis.)

Characteristics of coals and cokes; objectives of fundamental research; specific applications to the gas industry.

5557 Experiments With Shared and Individual Flues for Gas Appliances. W. J. Bennett and C. H. Purkis. *Institution of Gas Engineers, Copyright Publication*, no. 495, 1956, 39 p. (TP700 In7.3c Vis.)

5558 Observations on the Performance of a Multi-Flue System and of a Single Duct for Appliances With Room-Sealed Combustion Chambers. J. B. Carne and T. T. White. *Institution of Gas Engineers, Copyright Publication*, no. 496, 1956, 47 p. (TP700 In7.3c Vis.)

5559 Flame Stabilization in a Boundary Layer. Hoyt C. Hottel, Tau-Yi Toong, and John J. Martin. *Jet Propulsion*, v. 27, Jan. 1957, p. 28-30, 48.

A study of the stability of a lean propane-air flame in the boundary layer along a water-cooled slender rod with its longitudinal axis lying at the center line of a large Pyrex duct.

5560 Applications of the Electronic Probe to the Study of Turbulent Flames. D. W. Denniston, Jr., J. R. Oxendine, D. H. Knapschaefer, D. S. Burgess, and B. Karlovitz. *Journal of Applied Physics*, v. 28, Jan. 1957, p. 70-75.

In spite of certain limitations, the electronic probe has proved to be useful in studies of the propagation, structure, and stability of turbulent flames.

5561 A Precision Calorimeter for the Measurement of Heats of Combustion. Charles E. Holley, Jr. and Elmer J. Huber, Jr. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2084, Nov. 1955, 18 p. (UF767 U3La Contin.)

Construction, operation, and calibration of a calorimeter for measuring heats of combustion of metals.

5562 Utilization of Lignite. Earl C. Miller and C. Freeman Hawley. *Mechanical Engineering*, v. 79, Jan. 1957, p. 23-26.

Spreader stokers will dominate the lignite-firing field in units of capacities to 250,000 lb. per hr. because of relatively low cost, low power consumption, and ability to operate effectively over an extreme load range. Units above 400,000 lb. per hr. would appear more suitable for pulverizer firing.

5563 The Structures and Shapes of Flames. Howard B. Palmer. *Mineral Industries*, v. 26, Jan. 1957, p. 1-3, 6.

Research on flame structure is centered principally upon temperature traverses, spectroscopic traverses, and mass spectrometric determinations of concentration profiles. In the last instance, efforts are being made to determine concentrations not only of stable species but also of molecular fragments.

5564 (Italian.) Developments in the Gasification of Solid Fuels in Great Britain. **Sviluppi nella gassificazione di combustibili solidi in Gran Bretagna.** F. J. Dent. *Rivista dei Combustibili*, v. 10, Nov. 1956, p. 787-802.

Developments in water gas manufacture, producer gas manufacture, and other processes for the complete gasification of coal.

5565 The Burning and Explosion of Single Crystals. B. L. Evans and A. D. Yoffe. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 325-333 + 8 plates.

The styphnates, fulminates, and azides are studied with a high-speed ciné microscope.

5566* Industrial Wastes Guide—By-Product Coke Industry. H. H. Black, G. N. McDermott, C. Henderson, W. A. Moore, and H. R. Pahren. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 53-75.

Report on survey of eight U. S. plants includes taste and odor studies and bioassays of coke plant wastes. Emphasis is on definition of the problem, pollutional effects, remedial measures, and methodology.

5567 Influence of Temperature on Mechanical Strength of Coke. John Varga, Jr. and H. W. Lownie, Jr. Paper from "Transactions of the American Foundrymen's Society". p. 217-222. (TS200 Am35t Vis.)

The mechanical strength of coke at room temperature gives no indication of its mechanical strength at the higher temperatures encountered in cupola operation. A test method is developed which is adaptable to a wide variety of materials.

5568 Use of Anthrafines for Producing Metallurgical Coke. J. B. Gayle, W. H. Eddy, and R. L. Brown. *U. S. Bureau of Mines, Report of Investigations* 5287, Dec. 1956, 19 p. (TN21 Un3r)

Carbonizing tests suggest that anthrafines should be useful in producing coke to meet any given set of specifications.

5569* New Furnace Design Reduces Flyash Problems. Paul F. Seibold. *Utilization*, v. 11, Jan. 1957, p. 33-34, 36.

Total reinjection of flyash in the Turbo furnace is claimed to eliminate necessity of its disposal by converting the ash to slag tapped from the furnace bottom.

5570 A Cascade Impactor for Determining the Drop-Size Distribution of Fuel Mists. J. L. Harp and J. M. Pilcher. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 55-428, Nov. 1955, 28 p. (TL507 Un3.18w Vis.)

The maximum size of droplet that may be classified satisfactorily has been extended to approximately 80 μ.

5571 Investigation of Flame Stability and Drag Losses for Flame Holders in a Free Stream. Gustave G. Kutzko. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 55-429, Nov. 1955, 52 p. (TL507 Un3.18w Vis.)

Hemispheric flame holder has minimum drag losses during combustion for a given mixture-composition and gas stream velocity. For homogeneous mixtures, the hollow and solid flame holders are equally effective.

See also: **5470** (natural gas consumption forecast); **5482** (use of consumer research in the gas industry); **5789** (fuel-oil atomization).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

5572 (English and French.) **The Airglow and the Aurorae.** E. B. Armstrong and A. Dalgarno, editors. 420 p. 1955. Pergamon Press, New York. (QC971 Ar57a)

Symposium surveying recent work on observational, experimental, and theoretical aspects.

5573* Microorganisms and Geochemical Methods of Oil Prospecting. Giorgio G. Soli. *American Association of Petroleum Geologists, Bulletin*, v. 41, Jan. 1957, p. 134-140.

Recent study indicates that the microbiological methods can offer a highly efficient tool for hydrocarbon prospecting.

5574* Evidence for a Critical Wind Velocity for Air-Sea Boundary Processes. Hugo Mandelbaum. *American Geophysical Union, Transactions*, v. 37, Dec. 1956, p. 685-690.

There is a marked discontinuity between Beaufort four and five.

5575 Ecological Interpretations of Pliocene and Pleistocene Stratigraphy in the Great Plains Region. John C. Frye and A. Byron Leonard. *American Journal of Science*, v. 255, Jan. 1957, p. 1-11.

The succession of gross ecological conditions through Neogene and quaternary time may be interpreted from the stratigraphy, geomorphological history, buried soils, and fossil mollusks and plants.

5576 Cordierite-Indialite Relations. Akiho Miyashiro. *American Journal of Science*, v. 255, Jan. 1957, p. 43-62.

Minerals in structurally intermediate states between indialite and common cordierite exist in nature as well as in artificial products. Their distinctive X-ray diffraction patterns and optical properties have led to a revised structural classification of cordierite group minerals.

5577* Sea Water Intrusion in California. Harvey O. Banks, Raymond C. Richter, and James Harder. *American Water Works Association, Journal*, v. 49, Jan. 1957, p. 71-88.

Details of the problem and results of both large scale and scale model investigations.

5578 Reconnaissance for Uranium in the Phosphoria Formation. George W. Bain. *Amherst College (U. S. Atomic Energy Commission)*, RME-3141, June 1956, 64 p. (UF767 Un3.1r Contin.)

5579* Soil Analysis as a Method of Geochemical Prospecting for Lead-Silver Deposits in the Keno Hill Area, Yukon. R. W. Boyle. *Canadian Mining Journal*, v. 78, Jan. 1957, p. 49-55.

Using dithizone to estimate heavy metal content, it was possible to locate lodes and vein faults by soil analyses.

5580 Contributions to the Geology of Uranium. Study of Radioactivity in Modern Stream Gravels as a Method of Prospecting. Randal T. Chew, III. 20 p. 1956. United States Government Printing Office, Washington, D. C. (TN270 C42s)

The detection of radioactivity anomalies by means of portable instruments of scaler type, and application of the method in locating deposits of radioactive ores in the Colorado Plateau.

5581* Measurements of Light Penetration in Relation to Vertical Migration and Records of Luminescence of Deep-Sea Animals. George L. Clarke and Richard H. Backus. *Deep-Sea Research*, v. 4, Dec. 1956, p. 1-14 + 2 plates.

Direct measurements of the intensity of light at the levels of certain deep scattering layers were made using a bathyphotometer capable of responding to illumination as low as 10^{-7} μw. per sq. cm. Vertical migration of the scattering layers was recorded by means of an echo sounder.

5582 Diamond Drill Handbook. James D. Cumming. 655 p. 2nd Ed. 1956. J. K. Smit & Sons, Toronto. (TN281 C91d2)

A guidebook for those interested in the relationship of diamond drilling to exploration and mine development. Includes data on drills, diamonds, drilling techniques, and standards.

5583* The Chemical Composition of Vein Minerals and the Nature of Ore Forming Fluids. Heinrich D. Holland. *Economic Geology*, v. 51, Dec. 1956, p. 781-797.

The distribution of minor elements in vein minerals can be used to define composition of the vein-forming fluid, temperature, and possibly the pressure prevailing during ore deposition.

5584 Polar and Tropical Aurorae. James Paton. *Endeavour*, v. 16, Jan. 1957, p. 42-47.

Description of low-latitude displays.

5585 Facts Concerning Uranium Exploration and Production. John E. Crawford and James Paone. 130 p. 1956. United States Government Printing Office, Washington, D. C. (TN 490.U7 Un3.5f)

General geological and mineralogical information; favorable prospecting areas; sample testing; available maps; radioactivity counters, prospecting, mining, and milling; U bearing areas in the U. S. and Alaska.

5586 (German.) The Fluorite Deposits in the World, Their Occurrence and Utilization. **Die Flussspatlagerstätten der Welt. Ihr Vorkommen und ihre Verwertung.** Gustav Einecke. 408 p. 1956. Verlag Stahleisen M.B.H., Düsseldorf. (TN948.F6 Ei62f)

Describes the worked and workable fluorite deposits of the world. Considers the general qualities of fluoritic minerals. Detailed information on the world's deposits. The present output of fluorite and its economics.

5587* Diffusion of Chemical Elements in Some Naturally Occurring Silicate Inclusions. Henry H. Woodard. *Journal of Geology*, v. 65, Jan. 1957, p. 61-84 + 2 plates.

A study of the nature and origin of the mineralogical and chemical zoning in the Kittery formation at York, Maine.

5588* Measurements at Sea of the Vertical Gradient of the Main Geomagnetic Field During the *Galathea* Expedition. J. Espersen, P. Andreasen, J. Egedal, and J. Olsen. *Journal of Geophysical Research*, v. 61, Dec. 1956, p. 593-624.

Instruments; techniques; measurements in the Pacific.

5589* Turbulence in the Ionosphere With Applications to Meteor-Trails, Radio-Star Scintillation, Auroral Radar Echoes, and Other Phenomena. H. G. Booker. *Journal of Geophysical Research*, v. 61, Dec. 1956, p. 673-705.

Effect of irregularities in electron density on scattering of radio waves.

5590 Hydraulic Fracturing in the Caddo-Pine Island Field. B. F. Patterson, Jr. *Journal of Petroleum Technology*, v. 9, Jan. 1957, p. 11-16.

Geology, development history, present drilling and completion practices, and results of the hydraulic fracturing process in stimulating production. Production histories on several wells.

5591 Selective Plugging of Injection Wells by in Situ Reactions. Wayne F. Hower and Joe Ramos. *Journal of Petroleum Technology*, v. 9, Jan. 1957, p. 17-20.

Methods of partially or completely plugging zones of high permeability in water injection wells.

5592 Post-War Developments in Geophysical Instrumentation for Oil Prospecting. D. T. Germain-Jones. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 1-8.

A brief review of magnetic, gravity, and seismic methods; well-logging devices.

5593 Microscopic Petrography. E. Wm. Heinrich. 296 p. 1956. McGraw-Hill, New York. (QE434 H36m)

Methods of microscopic study. General and specific petrographic descriptions of igneous, sedimentary, and metamorphic rocks.

5594* Continuous Mining With Extensible Belts. Michael Yonko. *Mining Congress Journal*, v. 43, Jan. 1957, p. 34-37.

Experience with this new transportation method that cuts labor and operating costs.

5595 The Aurora in Middle and Low Latitudes. Sydney Chapman. *Nature*, v. 179, Jan. 5, 1957, p. 7-11.

Geographical distribution; outstanding tropical auroras; auroras in the 20th century; plans for observations during the International Geophysical Year.

5596 What Those French Turbodrill Tests Show. J. O. Scott. *Oil and Gas Journal*, v. 55, Feb. 11, 1957, p. 121-122, 125.

Bit weight and rotational speed had equal effect in increasing drilling rates in a limestone formation.

5597* Loose-Boundary Hydraulics. *Overseas Engineer*, v. 30, Jan. 1957, p. 198-199.

British research station deals with problems concerning erosion, silting in rivers, estuaries, and along the sea coast.

5598 Air Drilling Pays Dividends. LeRoy Radford. *Petroleum Engineer (Management Ed.)*, v. 29, Jan. 1957, p. B21-B27.

Experience in three wells indicates straighter hole, fast penetration, fewer bits, and a direct saving on drilling costs of $5875. Problems arose in logging and coring.

5599 Effect of Modern Drilling Technology on Well Cost. Douglas Ragland. *Petroleum Engineer (Management Ed.)*, v. 29, Jan. 1957, p. B33-B36.

Technological improvements have kept well costs at 1950 levels. A few examples are described.

5600 Phase Changes and Resonance Effects in Radio Echoes From Meteor Trails. J. S. Greenhow and E. L. Neufeld. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1069-1076.

5601* The Effect of Permeability Profile on Field Flood Advance. C. Drew Stahl. *Producers Monthly*, v. 21, Jan. 1957, p. 7.

5602* Phase Behavior in Low Pressure Reservoirs. II. The Solubility of Natural Gas Hydrocarbon in Petroleum. A. J. W. Headlee. *Producers Monthly*, v. 21, Jan. 1957, p. 18.

Solubilities of methane, ethane, propane, iso-butane, n-butane, iso-pentane, n-pentane, and hexanes in reservoir oil.

5603* Water Flooding Pays Off on Prolific Dora Roberts Lease. J. D. Walters. *Producers Monthly*, v. 21, Jan. 1957, p. 20-27.

Performance data. Production is six times that obtained previous to water injection.

5604 Pumice, Pumicite, and Volcanic Cinders in California. Charles W. Chesterman. **Technology of Pumice, Pumicite, and Volcanic Cinders.** F. Sommer Schmidt. 119 p. 1956. State of California, Division of Mines, San Francisco. (TN21 C12b Vis.)

Contains numerous geological maps and photographs of the important producing districts, and charts and graphs illustrating the relationships between pumice concrete and ordinary sand-gravel concrete.

5605 Convection From the Earth's Surface. C. H. B. Priestley. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 287-304.

The non-linear temperature profile which obtains over heated ground allows convection plumes, once formed, to maintain themselves in existence with no preferred heat supply.

5606 Postglacial Hypsithermal Interval. Edward S. Deevey and Richard Foster Flint. *Science*, v. 125, Feb. 1, 1957, p. 182-184.

Stratigraphy and nomenclature relating to the long, warm interval spanned by Danish pollen zones V through VIII, dated from approximately 7000 B. C. to 600 B. C.

5607 Solar Energy on Clear and Cloudy Days. Sigmund Fritz. *Scientific Monthly*, v. 84, Feb. 1957, p. 55-65.

The principal absorptions and scatterings that solar energy undergoes in its course through our atmosphere. Spectral, geographic, and seasonal distribution of the energy that reaches the earth's surface.

5608 Solar Eclipses and the Ionosphere. W. J. G. Beynon and G. M. Brown, editors. 330 p. 1956. Pergamon Press, New York. (QB541 B46s)

A symposium of papers dealing with various theoretical considerations, ionospheric eclipse observations, solar radiation and layer theory, recombination, geomagnetic eclipse phenomena, and solar radio noise, plus a bibliography of pertinent literature.

5609 The Sun. Giorgio Abetti. (Translated from the Italian by J. B. Sidgwick.) 336 p. 1957. MacMillan Co., New York. (QB521 Ab39str)

Comprehensive treatment of all aspects of modern solar knowledge; instruments employed, methods of observation, results of telescopic and spectroscopic observation, theories of the Sun's constitution and internal economy, sources of solar energy, and solar-terrestrial relationships.

5610 Sampling Deep Ore Deposits by Rotary Drilling and Methods of Surveying and Controlling the Direction of Drill Holes. Russell R. Trengove and A. C. Johnson. *U. S. Bureau of Mines, Information Circular* 7768, Dec. 1956, 15 p. (TN21 Un3i)

5611 Water Injection to Give East Texas High Oil Recovery. L. J. Logan and Anthony Gibbon. *World Oil*, v. 144, Feb. 1957, p. 46-48.

Re-injection of salt water from wells back into producing formation maintains pressure, drives oil to wells, and keeps them flowing. Up to 90% of the oil originally in the reservoir ultimately may be recovered.

5612 Fishing Tools and Techniques. I. Jars. Weldon L. Medders. *World Oil*, v. 144, Feb. 1957, p. 89, 91-94.

Modern jarring tools and their operation.

5613 Chemical Additives Improve Fracturing. A. W. Coulter. *World Oil*, v. 144, Feb. 1957, p. 148 + 4 pages.

Types of fracturing fluids and the additives used with them.

See also: **4804** (rockets in high-altitude research); **5221** (methane in coal mines); **5517** (flow in gas reservoirs); **5681** (hot-wire anemometer).

GRAPHIC ARTS

5614 Graining Loft-Plates. F. A. Menelaus and A. C. Patrick. *Aircraft Production*, v. 19, Feb. 1957, p. 82-84.

Application of the Wheelabrator to the surface preparation of light-alloy sheets for full-scale lofting for lithographic reproduction.

5615* Synthetic Printing Ink Vehicles. Edward C. Haines. *American Ink Maker*, v. 35, Jan. 1957, p. 32-34.

Recent developments; characteristics and uses.

5616* Studies of Ink Transfer During Printing. Charles H. Borchers. *American Pressman*, v. 67, Jan. 1957, p. 32-35.

Ink and paper relationships. Tests with a modified LTF Pick Tester.

5617* (German and English.) **The Art of Printing and the Reader.** Karl d'Ester. *Archiv für Druck und Papier*, v. 2, no. 1, 1956, p. 7-29.

An essay concerning the reader's relationship with the writer and the printer.

5618* (German and English.) **The Creative Work of Contemporary Lettering Artists.** Fritz Genzmer. *Archiv für Druck und Papier*, v. 2, no. 2, 1956, p. 119-148.

An informal essay on the creative activity of a contemporary graphic artist, Johannes Boehland, and examples of his work.

5619* (German and English.) **A Process for Speed Gauging at Printing Machines in Case of Irregular Motions.** Wolfram Eschenbach and Kurt Wagenbauer. *Archiv für Druck und Papier*, v. 2, no. 3, 1956, p. 269-272.

Details of an electronic instrument for measuring sequence of speeds.

5620* (German and English.) **The Masking Process in Offset Printing.** Karl Steinhaus. *Archiv für Druck und Papier*, v. 2, no. 4, 1956, p. 393-404.

5621* High-Speed Auto-Platen Problems of Halftone Colour Printing. W. A. J. Blaker. *British Printer*, v. 70, Jan. 1957, p. 62-65.

5622 Color Correction for Offset Lithography. Bernard R. Halpern. 206 p. 1956. Lithographic Technical Foundation, Inc., New York. (NE2425 H16cc)

Standards and controls for materials and methods used throughout the entire reproduction process.

5623* Recent Developments in the Photographic Recording of Television Images. W. D. Kemp. *Journal of Photographic Sciences*, v. 4, Nov.-Dec. 1956, p. 137-142.

Tone distortions introduced by the photographic process can be compensated by use of non-linear electrical circuits. "High-gamma" recording method improves sensitivity. Transfer characteristics of a telecine machine are given.

5624* Contact Screens for Halftone. III. Frank H. Smith. *Modern Lithographer and Offset Printer*, v. 52, Dec. 1956, p. 15-16, 18.

Quality considerations using the magenta contact screen. (To be continued.)

5625* Recent Developments in Lithography. Michael H. Bruno. *Modern Lithography*, v. 25, Jan. 1957, p. 63, 65.

Sensitivity guide, densitometer, and inkometer are among recent developments responsible for stabilizing consistency of plates.

5626* The Scanner in Color Reproduction. Vincent C. Hall and Joseph G. Jordan. *Pacific Printer, Publisher and Lithographer*, v. 96, Jan. 1957, p. 19 + 4 pages.

Review of processes which must be performed in making color printing plates. (To be continued.)

5627* Materials of Construction for Color Processing Equipment. John R. Turner. *Photographic Science and Technique*, v. 3, Nov. 1956, p. 137-144.

Factors affecting choice of materials; effects of photographic solutions; effects of materials on the film or paper being processed; examples of various materials.

5628 Photolytic Darkening and Electronic Range in AgCl. Frederick C. Brown and Nathan Wainfan. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 93-99.

Marked differences in the initial rate of darkening were found for vacuum or air anneal, and crystals treated in chlorine showed little or no darkening wtihin their volume.

5629 Photolytic Behavior of AgCl. Nathan Wainfan. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 100-102.

Shape of the absorption band induced by 416-mμ. radiation is a function of crystal temperature. The 580 mμ. light, while initially bleaching the crystal selectively, was found to be able to completely destroy the induced color in the crystals.

5630* Letterpress Composition Conversion Methods for Offset and Gravure. II. Eldon L. Thompson. *Printing Equipment Engineer*, v. 87, Feb. 1957, p. 46-49.

Comparison of Brightype, translucent proof, reproduction proof, double-offset transfer, and direct-image methods.

5631* Print Quality in Offset Lithography. II. Bruce E. Tory. *Process*, v. 64, Jan. 1957, p. 10-13.

Relationship between halftone transparency and press print; practical use of the tone reproduction study; the four-quadrant diagram.

5632* The Scientific Principles of Photomechanics. Frank H. Smith. *Process*, v. 64, Jan. 1957, p. 29, 31.

Solution of problems dealing with total internal reflection.

5633* Extrinsic Factors in Stereo. Herbert C. McKay. *PSA Journal*, v. 23, Jan. 1957, p. 20-21.

Factors to be considered include differential focus, perspective, overlapping contours, aerial haze, and color loss.

5634 Rotogravure. A Survey of European and American Methods. H. M. Cartwright and Robert MacKay. 303 p. 1956. Mackay Publishing Co., Lyndon, Kentucky. (NE2890 C24r Over.)

Background information; techniques of rotogravure engraving, printing, and converting.

5635* Illumination Control for a Direction-Indicating System for the M-45 Tracking Camera Mount. Samuel E. Dorsey. *Society of Motion Picture and Television Engineers, Journal*, v. 65, Dec. 1956, p. 631-635.

Circuit details.

5636* Densitometry of an Embossed Kinescope Recording Film. W. R. J. Brown, C. S. Combs, and R. B. Smith. *Society of Motion Picture and Television Engineers, Journal*, v. 65, Dec. 1956, p. 648-651.

5637* Processing Methods for Use With Two New Black-and White Reversal Films. C. E. Ives, J. W. Zuidema, N. A. Exley, and C. C. Wilt. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Jan. 1957, p. 1-11.

Recommendations for processing-bath composition and replenishing practice.

5638* A Method Using Dielectric Heating for Splicing Motion-Picture Film. R. W. Upson, Emery Meschter, and W. R. Holm. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Jan. 1957, p. 14-17.

5639* High-Speed Explosive Argon-Flash Photography System. Robert G. S. Sewell, Lawrence N. Cosner, Henry W. Wedaa, and Rolland Gallup. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Jan. 1957, p. 21-24.

System comprises an explosive-train assembly, a Fresnel lens, and a number of cameras.

5640* (Russian.) Studies of the Sensitization of Photographic Emulsions. **Issledovaniia po opticheskoi sensibilizatsii fotograficheskikh emulsii. VI.** Adsorption of Sensitizers on Emulsion Microcrystals of Various Types. **Adsorptsiia sensibilizatorov na emul'sionnykh mikrokristallakh razlichnykh tipov.** B. V. Barbarin and Iu. N. Gorokhovskii. *Zhurnal Nauchnoi i Prikladnoi Fotografii i Kinematografii*, v. 1, Nov.-Dec. 1956, p. 419-424.

The most adsorptive were the bromoiodosilver emulsions; the least adsorptive were the AgCl emulsions.

5641* (Russian.) The Rate at Which Agents Penetrate the Emulsion Layer on Thickly Coated Film. **Skorost' proniknoveniia proiiavliaiushchikh veshchestva v emul'sionnyi sloi tolstosloinykh plastinok.** S. G. Bogdanov and N. V. Poliakova. *Zhurnal Nauchnoi i Prikladnoi Fotografii i Kinematografii*, v. 1, Nov.-Dec. 1956, p. 425-428.

Problems connected with the developing of films exposed to the action of ionizing particles. Effects of the chemical composition of the developing agent, its concentration, and pH on the rate of penetration were studied.

See also: **5552** (photographic studies of flame structure).

HEAT POWER

5642* Mobile Gas-Turbine Power Stations in Operation in Mexico. E. Lerch and J. Gutiérrez. *Brown Boveri Review*, v. 43, Oct. 1956, p. 407-411.

Cost comparisons indicate that the gas turbine is the ideal prime mover for a mobile power station.

5643* The Steam Power Station of Esbjerg in West Denmark. K. Heimann. *Brown Boveri Review*, v. 43, Oct. 1956, p. 412-416.

Operating data.

5644 The Oxidation, Decomposition, Ignition, and Detonation of Fuel Vapors and Gases. XXX. The Hydrogen Engine and Detonation of the End Gas by the Igniting Effect of Carbon Nuclei Formed by Pyrolysis of Lubricating Oil Vapor. R. O. King and S. V. Hayes. *Canadian Journal of Technology*, v. 34, Jan. 1957, p. 442-454.

5645 Liquid Metal in a Double-Reheat Fuel-Fired Steam Plant. E. W. Burstadt, D. E. Hart, L. J. Marshall, and H. R. Shannon. *Combustion*, v. 28, Jan. 1957, p. 53-60.

Future system developments and a rise in fuel costs may soon justify use of liquid metal, which is currently uneconomical.

5646 Direct Fired Coal Burning Gas Turbine Operations. Peter R. Broadley and William M. Meyer. 20 p. 1956. Bituminous Coal Research Inc., Dunkirk, New York. (TJ622 B54d Over.)

Report on a test program aimed at development of a coal burning gas turbine locomotive.

5647* 200,000 kw. Reheat Boiler Design for the Hydro-Electric Power Commission of Ontario, Richard L. Hearn Station. F. W. Cranston and M. G. Ireland. *Engineering Journal*, v. 40, Jan. 1957, p. 3-14, 26.

5648* A Radioactive Deposit Gage for Engines. B. A. Fries, J. G. Mingle, and H. W. Sigworth. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 270-275 + 1 plate.

Description of gage based on a removable plug with a radioactive surface which forms part of the inside wall of the engine. A deposit accumulates on this surface while the engine runs. Its thickness is measured by removing the plug and comparing the attenuation of the radiation caused by the deposit with that caused by absorbers of known thickness.

5649* Scavenging Characteristics of a Two-Stroke-Cycle Engine as Determined by Skip-Cycle Operation. P. M. Ku and T. F. Trimble. *Journal of Research, National Bureau of Standards*, v. 57, Dec. 1956, p. 325-331.

A method for determining the mass fraction of fresh charge in the cylinder from measurements of engine power under normal operation and with engines fired only once in several cycles of operation. Results with a crankcase-scavenged engine.

5650* Figure Combined Turbine-Condenser Curves. E. V. Pollard. *Power*, v. 101, Feb. 1957, p. 80-85, 202.

How to combine separate performance data for turbine generator and main surface condenser to obtain unit performance.

5651* The Role of the Turbine in Future Vehicle Powerplants. C. G. A. Rosen. *SAE Journal*, v. 65, Jan. 1957, p. 42-56.

5652* Rockets Burning Pre-Mixed Gaseous Propellants. Loren E. Bollinger. *Shell Aviation News*, no. 222, Dec. 1956, p. 15-18.

Injector design; flow requirements; engine design and performance.

5653 Identification of Foreign Objects Damaging Compressor Blades in Turbojet Engines. A. E. Spakowski and J. Graab. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* E56J12, Jan. 1957, 12 p. (TL782 Un3rm Vis.)

A rapid emission spectroscopic method was devised to identify the chemical composition of foreign objects from the trace of material left behind on the damaged blade.

5654 Theoretical Performance of Liquid Hydrogen and Liquid Fluorine as a Rocket Propellant for a Chamber Pressure of 600 Pounds Per Square Inch Absolute. Anthony Fortini and Vearl N. Huff. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* E56L10a, Jan. 1957, 38 p. (TL782 Un3rm Vis.)

Data reported permits interpolation of complete performance data for any equivalence ratio from 1.20 to 0.15, chamber pressure from 300 to 1200 psi.a., and pressure ratios up to 1500.

5655 Effect of Chord Size on Weight and Cooling Characteristics of Air-Cooled Turbine Blades. Jack B. Esgar, Eugene F. Schum, and Arthur N. Curren. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3923, Jan. 1957, 37 p. (TL570 Un3t)

Turbine blade weight is affected to a much smaller degree by the size of the blade chord for air-cooled blades than for solid uncooled blades. Considerable savings in coolant flow are possible by using a smaller number of large-chord blades rather than a larger number of small-chord blades.

See also: **4808** (jet engine noise); **4814** (pulse-jet engine mounted on a helicopter rotor); **5074** (reduction of oxygen in steam power plants); **5362** (steam generator and turbine for electronic plant); **5505** (flow in axial cascades); **5807** (cast jet engine parts); **6197** (automotive fuel consumption).

INFORMATION—PREPARATION AND DISSEMINATION

5656* Abstracting and Indexing Services in Electronics and Related Electrical Fields. John T. Milek. *American Documentation*, v. 8, Jan. 1957, p. 5-21.

A list of 160 U. S. and foreign abstracting and indexing services with brief descriptions of each.

5657* Evaluation of Coordinate Indexing at the Naval Ordnance Test Station. Masse Bloomfield. *American Documentation*, v. 8, Jan. 1957, p. 22-25.

Experience with the Uniterm System of subject headings.

5658* New Indexing-Abstracting System for Formal Reports, Development and Proof Services, Aberdeen Proving Ground. Allen Kent and J. W. Perry. *American Documentation*, v. 8, Jan. 1957, p. 34-46.

Procedures involved in the preparation and editing of abstracts on ordinance material. Coordination with indexing.

5659* Correlative Indexes. II. Correlative Trope Indexes. Charles L. Bernier. *American Documentation*, v. 8, Jan. 1957, p. 47-50.

A method of simplifying subject indexing by decreasing the vocabulary used. This involves substitution of generic terms for the specific.

5660 Aristotle: Rhetoric, an Abstract of Principles of Public Speaking. Pat M. Ryan, Jr. 17 p. 1956. Department of Publications, Colorado School of Mines, Golden, Colorado. (PN173 Ar46r)

Portions of Aristotle's *Rhetoric* are presented in a modernized form, designed to provide a brief, useful guide for purposeful public speaking.

5661 Documentation in Action. Jesse H. Shera, Allen Kent, and James W. Perry, editors. 471 p. 1956. Reinhold Publishing Corp., New York. (Z1001 Sh52d)

A compilation of papers presented at the 1956 Western Reserve Conference on the Practical Utilization of Recorded Knowledge. Recent advances in documentation are summarized and evaluated with particular attention to systems; equipment for making information available as needed; use of recorded information in research, in decision-making, and in education for librarianship.

5662* What the Technical Reader Expects of the Scientist and Engineer Who Write. Everett S. Lee. *Electrical Engineering*, v. 76, Jan. 1957, p. 50-52.

Stresses importance of effective dissemination of ideas.

5663 Journals Most Cited by Chemists and Chemical Engineers. Richard L. Barrett and Mildred A. Barrett. *Journal of Chemical Education*, v. 34, Jan. 1957, p. 35-38.

A statistical survey.

5664* So You're Going to "Read" a Paper. Harold O. Haskitt, Jr. *Journal of Engineering Education*, v. 47, Jan. 1957, p. 393-396.

Some tips for the speaker.

5665* Manuscripts and Archives. R. W. G. Vail. *Library Trends*, v. 5, Jan. 1957, p. 309-416.

Includes 12 papers on various aspects of the collection, care, and handling of manuscripts, archives, films, and sound recordings.

5666 Mass Communication. Erik Barnouw. 280 p. 1956. Rinehart & Co., New York. (HE8694 B26m)

Guide to communication via television, radio, film, and press. Psychology, problems, and characteristics. Examples of successful use.

See also: **5747** (metallurgical dictionary); **5763** (bibliographies of corrosion products).

INSTRUMENTATION

5667 The Measurement of the Thickness of Thin Carbon Films. A. W. Agar. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 35-36.

A nearly linear relationship was found between the optical density and the thickness of evaporated carbon films.

5668 Barium Getters and Oxygen. R. N. Bloomer. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 40-43.

Sorption of O by films of Ba evaporated in a vacuum was studied and the speed of pumping and capacity were measured.

5669* (French.) Construction of a Laboratory Furnace With Controllable Vacuum for High Temperatures. **Sur la construction d'un four de laboratoire à vide contrôlé pour hautes températures.** E. Bonnier. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1722-1726.

Details on the construction of a 10 kv. amp. resistance furnace made of Mo for temperatures up to 1,500 C under high vacuum. No cellular refractory material and only reflective insulation are used. Advantages and applications.

5670 A Precision Apparatus for Applying Liquids to Test Surfaces. E. E. Buckholz. *Canadian Journal of Technology*, v. 34, Jan. 1957, p. 399-404.

Apparatus delivers up to five ml. of liquid in droplets of uniform size. Mean diameter of the droplets can be varied from 0.3 to 1.6 mm.

5671* Electric Clutch Couplings for Instrument Gear Trains. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 121-123.

Remotely actuated electric clutches control the paper drive transmission in a photo-recording oscillograph.

5672* Testing Indentation and Abrasive Hardness of Hard Materials. II. Indentation Hardness. P. Grodzinski. *Industrial Diamond Review*, v. 16, Dec. 1956, p. 228-233.

The double cone method of hardness measurement. (To be continued.)

5673* New 300 kV Electron Microscope. Bunya Tadano, Yoneichiro Sakaki, Susumu Maruse, and Nozomu Morito. *Journal of Electronmicroscopy (Annual Ed.)*, v. 4, 1956, p. 5-9.

Instrument is used to study thick specimens. High voltage is obtained with a Van de Graaff static generator.

5674* Colour in Electron Microscopy and Radiography. G. E. Donovan. *Journal of Photographic Science*, v. 4, Nov.-Dec. 1956, p. 142-144.

Methods for producing color radiographs and electronmicrographs using high, medium, and low kilovoltage film as color separation negatives to give a single picture.

5675 Construction of a Kösters Double-Image Prism. J. B. Saunders. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 21-26.

Interferometric procedures, whereby these compound prisms can be accurately constructed and cemented with hardened cements that favor stability and permanence of calibration.

5676 The Kösters Interferometer. J. B. Saunders. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 27-31.

Modification of the Kösters prism forms a simple interferometer that is easy to apply to the testing of lenses, mirrors, and combinations of these elements.

5677 Wavelengths From Iron-Halide Lamps. Robert W. Stanley and William F. Meggers. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 41-49.

Iron lines obtained from an electrodeless lamp, containing a minute amount of iron bromide, permit higher accuracy of wavelength measurement than the standard method. Wavelengths of 103 radiations from such a lamp were measured with Fabry-Perot interferometers.

5678 Contrast Arising From Elastic and Inelastic Scattering in the Electron Microscope. M. E. Haine. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 9-15.

Contrast is calculated on a wave-optical basis. Of major importance is the gap left in the illuminating wavefront by the inelastically scattered electrons. The next most important effect is by phase contrast with elastic scattering.

5679 Two Optical Instruments Used in Semiconductor Research. D. G. Avery. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 16-17.

A single-prism monochromator and a light-spot microscope are described.

5680 A Bent Crystal X-Ray Spectrograph. G. B. Deodhar and R. C. Karnatak. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 21-23.

Principle, construction, and performance of transmission-type device.

5681 A Linear, Temperature Compensated Hot-Wire Anemometer. E. L. Deacon and D. R. Samuel. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 24-26.

Instrument gives a linear output over the range of wind speed 1 to 16 m. per sec., and so is suited to studies of atmospheric turbulence.

5682 Measurement of High Viscosities by Shearing Between Parallel Plates. F. E. Humphreys and N. Stone. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 26-27.

Viscosities in the range 10^4-10^7 poises were measured by shearing thin films between two parallel stainless steel plates.

5683 A Portable Ionization Current Comparator. L. A. W. Kemp and B. J. Banfield. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 27-30.

Instrument employs a single sub-miniature electrometer valve in a null circuit, together with a taut-suspension reflecting galvanometer system, which is built-in.

5684 Continuously Indicating Precision Magnetometer. G. W. Green, R. C. Hanna, and S. Waring. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 4-8.

Design, operation, and performance.

5685 Electrostatic Lens. N. P. Carleton. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 9-10.

A possible electrostatic lens consists of a cylindrical surface along which the potential varies as the square of the distance from some original plane. A short section of the cylinder with open ends serves as a thick lens for focusing a beam of particles.

5686 Rotating Probe Electrometer. J. C. Devins and S. I. Reynolds. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 11-13.

Instrument can measure charge on areas as small as 0.3 sq. cm. at a rate fast enough to show changes in charge distribution on a dielectric surface within intervals of the order of 30 m.sec.

5687 Line Shapes and Intensities for Disk Sources Used in an Homogeneous Magnetic Field Beta-Ray Spectrometer With New and Conventional Slit Geometries. David B. Beard. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 19-27.

5688 Schlieren Method for Mass Determinations in Microscopic Dimensions. Jurgen R. Meyer-Arendt. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 28-29.

Principles and formulas for use in computing refractive index, mass concentration, and the anhydrous mass of microscopic particles like cells or cell constituents.

5689 Conversion of an Infrared Spectrophotometer Incorporating a Memory System to Double Beam Operation. K. M. M. Kruse. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 40-42.

5690* Carbon Surface Replicas for Electron Microscopy and Electron Diffraction. D. B. Scott and R. W. G. Wyckoff. *Royal Microscopical Society, Journal*, v. 75, ser. 3, pt. 4, 1955, p. 217-222 + 4 plates.

Describes use of evaporated carbon films in the preparation of pseudo-replicas. The areas selected microscopically for diffraction can be as small as one square μ.

See also: **5523** (reflectometer); **5536** (electron paramagnetic resonance spectrometer); **5561** (precision calorimeter); **5570** (determination of drop-size distribution in mists); **5592** (geophysical instrumentation); **5593** (microscopic petrography); **5693** (electronic oil thickness indicators); **5968** (metallurgical microscopes); **6006** (scintillation counter); **6055** (neutron-monochromator); **6127** (constant-strain tension tester); **6128** (extensometer for thin films); **6284** (solar furnaces).

LUBRICATION AND FRICTION

5691 Anti-Friction Bearings. Hudson T. Morton. 395 p. 1954. Hudson T. Morton, Ann Arbor. (TJ1071 M84a Over.)

An engineering manual giving types, sizes, load characteristics, and criteria of selection of anti-friction bearings for typical applications. Also covers standards, lubrication, and metallurgical aspects.

5692 Design Study of a Hydrostatic Gas Bearing With Inherent Orifice Compensation. S. K. Grinnell and H. H. Richardson. *ASME, Transactions*, v. 79, Jan. 1957, p. 11-21.

5693* Electronic Indicators Show Oil Thickness on Bearings. II. M. L. Greenough and Charles E. White. *Bureau of Ships Journal*, v. 5, Feb. 1957, p. 26-31.

Development of electronic probe that converts minute distance changes of varying oil film thicknesses to an electrical signal.

5694 Adhesion and Friction. F. P. Bowden. *Endeavour*, v. 16, Jan. 1957, p. 5-18.

Friction of plastics, wood, graphite, and other substances.

5695* Hydrodynamic Lubrication of Piston Rings and Commutator Brushes. W. Lewicki. *Engineer*, v. 203, Jan. 18, 1957, p. 84-86.

Mathematical analysis. (To be continued.)

5696 Why Materials Wear. Verne Pulsifer. *Frontier*, v. 19, Winter 1956, p. 8-11.

Types of wear and their occurrence; wear resistant structures.

5697* Special Materials for Unusual Ball Bearing Applications. William Blinder. *General Motors Engineering Journal*, v. 4, Jan.-Mar. 1957, p. 42-46.

Material evaluation methods; high-temperature, non-magnetic, and corrosion-resistant applications; principal properties of ball-bearing and separator materials.

5698* An Analysis of Orifice- & Capillary-Compensated Hydrostatic Journal Bearings. A. A. Raimondi and J. Boyd. *Lubrication Engineering*, v. 13, Jan. 1957, p. 28-37.

Loading, operation, and design data.

5699* More Uses Found for Solid Lubricants. II. W. J. Simpson and M. C. McLaren. *Plant*, v. 15, Jan. 1957, p. 52-54.

General observations concerning stability, ultra-high speed performance, and prevalent misconceptions about various greases.

5700 Stresses in Large Ring Bearings. Thomas Stone Williams. *Product Engineering*, v. 28, Feb. 1957, p. 160-163.

Formulas for stress, graphs, and sample calculations with inner race treated as infinite beam on elastic foundation.

5701* A New Synthetic Thickener for Multipurpose Lubricating Grease. J. L. Dreher, B. W. Hotten, and C. F. Carter. *Spokesman*, v. 20, Feb. 1957, p. 10-15.

A laboratory evaluation of sodium N-octadecylterephthalamate greases.

5702* (Russian.) Studying the Wear Resistance of Steel Subjected to Abrasion. **Issledovanie iznosostoikosti stali v abrazivnoi srede.** M. M. Tenenbaum and V. M. Guterman. *Vestnik Mashinostroeniia*, v. 36, Dec. 1956, p. 25-29.

Effects of sliding on the wear of specimens of various hardnesses. Influence of various depths of case-hardening.

See also: **5307** (rolling friction); **5316** (Teflon lubricants); **6161** (lubrication of thrust bearing).

MECHANICAL ENGINEERING

5703* Rigid Frame Failures. Boyd G. Anderson. *American Concrete Institute, Journal*, v. 28, Jan. 1957, p. 625-636; *ACI* Proceedings, v. 53, 1957, p. 625-636.

General nature of failures in concrete structures. Materials and construction procedure. General comments on shear design.

5704* Laboratory Investigation of Rigid Frame Failure. Richard C. Elstner and Eivind Hognestad. *American Concrete Institute, Journal*, v. 28, Jan. 1957, p. 637-668; *ACI Proceedings*, v. 53, 1957, p. 637-668.

Failure of warehouse roof was attributed to a combination of diagonal tension due to dead load and axial tension due to shrinkage and temperature change. This can be avoided by sufficient web reinforcement, sufficient extension of longitudinal reinforcement beyond the region of contraflexure, and effective expansion joints.

5705* Equalizing Types of Suspension. J. M. Pevsner. *Automobile Engineer*, v. 47, Jan. 1957, p. 10-16.

General analysis of layouts of the systems employed on the Packard and Citroën-2CV cars.

5706 A Photoelastic Method Employing Scattered Light for the Solution of Plane Stress Problems. W. Shelson and I. W. Smith. *British Journal of Applied Physics*, v. 7, Dec. 1956, p. 436-439.

Method is based on the combined use of three retardation fringe patterns; a standard isochromatic pattern and two perpendicular scattered light patterns.

5707 A Tilting Stage Method for Three-Dimensional Photoelectric Investigations. H. T. Jessop. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 30-32.

5708* Grid Bridge Design. Louis Balog. *Civil Engineering*, v. 27, Jan. 1957, p. 40-45.

Simple procedures for the computation of the grid action of bridges gives satisfactory results for design purposes, as shown by examples of simple and continuous bridges of concrete and steel.

5709* Non-Linear Bending of a Circular Plate Under Normal Pressure. Eleazer Bromberg. *Communications on Pure and Applied Mathematics*, v. 9, Nov. 1956, p. 633-659.

Boundary layer theory was applied to the determination of stresses and deformations produced by a uniform normal load on a thin circular plate for a wide range of values of the load and the thickness of the plate.

5710* Combining Hydraulic Torque Converters With A-C Motors. Wayne Howard. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 90-93, 330.

The hydraulic converter greatly enhances the ability of an a.c. motor to accelerate high-inertia loads. Companion benefits are shock isolation and virtually unlimited over-load protection.

5711 Virtual Work and the Moment Distribution Method. Determination of Sway Movement in Frames. B. G. Neal. *Engineering*, v. 183, Jan. 11, 1957, p. 47-50.

In applying sway corrections in a moment distribution analysis of a complicated framework, it is necessary to analyze the geometry of each possible independent sway movement. The correct amount of each sway movement which actually occurs is then determined by ensuring that the appropriate equations of equilibrium are satisfied.

5712* Cost-Conscious Packaging Does More Than Cut Packaging Costs. Elmer A. Kruse. *Flow*, v. 12, Feb. 1957, p. 110-113.

Better, faster operating machinery is likely to be discovered, and changes in packaging materials with resultant improvements in protective qualities of packages are natural developments when a packaging department starts to recognize and do something about costs. (To be continued.)

5713 Mechanical Properties of Materials for Combined Stresses Based Upon True Stress and Strain. Joseph Marin. *Franklin Institute, Journal*, v. 263, Jan. 1957, p. 35-46.

Derivation of mathematical relationships.

5714 Significance of Material Properties in Design for Fatigue Loading. II. Joseph Marin. *Machine Design*, v. 29, Feb. 7, 1957, p. 95-99.

A review of generalized failure theories and design recommendations for static stresses and static stress concentrations.

5715 How Profile Errors Affect Cam Dynamics. Ray C. Johnson. *Machine Design*, v. 29, Feb. 7, 1957, p. 105-108.

An analytical method for predicting influence of dimensional variations upon velocity and acceleration.

5716 Vibration Frequency Charts. J. N. Macduff and R. P. Felgar. *Machine Design*, v. 29, Feb. 7, 1956, p. 109-115.

Nomographs and tables for rapid analysis of vibration characteristics of mechanical structural elements.

5717 Power Transmission Characteristics of Hydraulic Torque Converters. H. L. Wilke. *Machine Design*, v. 29, Feb. 7, 1957, p. 116-120.

5718 Mechanics for Engineers. Statics and Dynamics. Ferdinand P. Beer and E. Russell Johnston, Jr. 673 p. 1957. McGraw-Hill, New York. (QA807 B39m)

This beginning text for college students is illustrated with many practical problems.

5719* How to Determine the Tolerances of a Shaft Rotating in Two Bearings. P. Sillano. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 229-240.

5720* The Design for Minimum Weight of Simply-Supported Flat Grillages to Withstand a Single Concentrated Load. J. Clarkson. *North East Coast Institution of Engineers & Shipbuilders, Transactions*, v. 73, Jan. 1957, p. 145-178.

5721 Practical Problems in Soil Mechanics. Henry R. Reynolds and P. Protopapadakis. 2nd Ed. 205 p. 1956. Crosby Lockwood & Son, Ltd., London. (TA710 R33p)

Application of methods and analyses to practical problems such as may occur in the experience of the practicing engineer.

5722 Analysis and Design of Air Motors. Otmar E. Teichmann. *Product Engineering*, v. 28, Feb. 1957, p. 167-178.

Non-dimensional relationships for pressure drops, torque losses, and efficiencies as functions of motor dimensions. Design analysis of new and existing motors.

5723 High-Speed Electrostatic Clutch. C. J. Fitch. *Product Engineering*, v. 28, Feb. 1957, p. 189-191.

Principles of operation; clutch construction and performance; three-clutch design example.

5724 Epicyclic Gears for Control Mechanisms. J. W. Edgemond, Jr. *Product Engineering*, v. 28, Feb. 1957, p. 194-198.

Unusual arrangements of epicyclic gear trains for control, counting, and other light-duty high-reduction mechanisms.

5725* On the Steady-State Thermoelastic Problem for the Half-Space. E. Sternberg and E. L. McDowell. *Quarterly of Applied Mathematics*, v. 14, Jan. 1957, p. 381-398.

Determination of steady-state thermal stresses and displacements in a semi-infinite elastic medium which is bounded by a plane.

5726* A Concise Technical History of Manual Steering Mechanisms From 1900 to 1951. C. W. Lincoln. *SAE Journal*, v. 65, Jan. 1957, p. 66-71.

5727* (German.) Buckling, Bending and Bulging in Steel Construction. **Knicken, Kippen und Beulen im Stahlbau. II.** L. Stabilini. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 22, Dec. 1956, p. 377-388.

A survey of various forms of elastic and plastic instability caused by the increase of design stresses and the corresponding decrease in the structure heaviness. Preventive measures are offered.

5728* How to Plan for Automatic Assembly. George H. Kendall. *Tool Engineer*, v. 38, Feb. 1957, p. 96-98.

Steps involved in initial survey and detailed planning. Cost considerations, installation, and tryout.

5729 Preparation and Testing of a Titanium-Lined Pipe Section for Standard Ring-Joint Gaskets. V. M. Hovis, R. C. Kinser, R. G. Trehearne, and D. B. Woodbridge. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1288, Jan. 1957, 33 p. (UF767 Un3.1k Contin.)

A hot-spinning technique for extending the Ti out over the flanges provided a satisfactory leak-tight joint.

5730 Approximate Methods of Calculating the Strength of Plywood. L. J. Markwardt and A. D. Freas. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1630, Apr. 1956, 5 p. (TS800 Un3.3r Contin.)

5731 Vibration Analysis Tables. R. E. D. Bishop and D. C. Johnson. 59 p. 1956. Cambridge University Press, London. (QA935 B54v)

Receptances, frequencies, and flexibilities of simple and composit shafts and beams.

See also: **5340** (anti-roll stabilization of ships); **5376** (automobile headlamps); **5745** (design of Cu-alloy forgings); **5823** (design of diecastings and diecasting dies); **6107** (noise in pneumatic systems); **6193** (O-rings for static uses); **6252** (design of joints).

METALLURGY

5732* Molybdenum. I. Production and Fabrication. D. O. Pickman. *Alloy Metals Review*, v. 8, Dec. 1956, p. 2-8.

Melting, machining, and welding are described.

5733* Metal Containers for Aerosols. David S. Tillotson. *American Perfumer and Aromatics*, v. 69, Jan. 1957, p. 82, 87.

Types of metal containers according to material and fabrication. Manufacturers of aerosol components and metal containers.

5734 Business in a Platinum Setting. *Business Week*, no. 1431, Feb. 2, 1957, p. 90-94.

Platinum is finding an important role in industry. New applications are illustrated.

5735* Stainless Steel From the User's Point of View. H. J. Wilson. *Chemical & Process Engineering*, v. 38, Jan. 1957, p. 5-10.

Types of stainless steels. Problems of design and construction of chemical equipment. Corrosion behavior in some common chemicals.

5736* Metallurgy. H. A. Holden. *Chemical & Process Engineering*, v. 38, Jan. 1957, p. 15-18.

Advances in the development and uses of steels, Mg, Ti, and other metals.

5737 (French.) The Metallurgy of Uranium. **La métallurgie de l'uranium.** G. Cabane. *Énergie Nucléaire, Suppl. to Chimie et Industrie*, v. 76, Oct. 1956, p. 18-24.

A historical survey of the development of U metallurgy in France during the past ten yrs. and a description of U properties.

5738 (French.) Zirconium. **Le zirconium.** René Faivre. *Énergie Nucléaire, Suppl. to Chimie et Industrie*, v. 76, Oct. 1956, p. 32-45.

A study of the structure and properties of Zr, its natural state, the methods used for its purification, the Kroll process for the production of ductile Zr, and the common and nuclear applications of this metal.

5739 High-Temperature Materials. Metals and Alloys for Aircraft-Engine Construction. H. E. Gresham. *Engineering*, v. 182, Dec. 28, 1956, p. 818-820.

Steels for turbine discs; materials for gas-turbine blades and nozzle guide vanes; light alloys.

5740 International Agreement Sought on Specifications for Gray Iron. H. W. Lownie Jr. *Foundry*, v. 85, Feb. 1957, p. 120-122.

These proposed international specifications are intended to measure and define the quality and properties of the iron poured into the molds rather than the properties of the castings.

5741* (German.) Creep-Resistant Steel Castings for Medium and High Temperature. **Dauerstandfester Stahlguss für das mittlere und hohe Temperaturgebiet.** H. Zeuner. *Giesserei*, v. 44, Jan. 3, 1957, p. 1-7.

Material characteristics; safety factor in design calculations; hardening and tempering of alloy steels. Suggestion for fabricators and foundrymen.

5742* (English.) **Qualitative Test for Si-Cr-W Shock Resisting Tool Steel.** Sadao Koshiba, Kazuo Tanaka, and Tsuneo Kunou. *Hitachi Review*, Nov. 1956, p. 19-21, 18.

Research concerning the effect of Si in Si-Cr-W steel.

5743 How to Get More for Your Metalworking Dollar. VII. Aluminum. *Iron Age*, v. 179, Jan. 31, 1957, p. 57-72.

Property data useful to the designer, engineer, and fabricator. Suggestions for selecting the right alloy and fabricating process.

5744* Symposium on Titanium. *Journal of Metals*, v. 9, Jan. 1957, p. 161-184.

Includes papers on sponge production economics, fabrication economics, analytical developments, and practical problems associated with the control of interstitials in welding, forming, melting, and mill processing.

5745 Design Considerations for Copper Alloy Forgings. Arthur I. Heim. *Machine Design*, v. 29, Feb. 7, 1957, p. 100-104.

Material properties; alloy selection, recommended design practices.

5746 Magnesium Up-to-Date. Papers individually paged. 1956. Magnesium Assn., New York. (TN799.M2 M27ma Over.)

A compilation of papers dealing largely with the applications of Mg., and including properties and design considerations.

5747 A Dictionary of Metallurgy. Vi-We. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 21-28.

Defines "vicalloy" to "welding". (To be continued.)

5748 (German.) Non-Ferrous Alloy Handbook. **Legierungshandbuch der Nichteisenmetalle.** Ernst Brunhuber. 196 p. 1954. Fachverlag Schiele & Schön, Berlin. (TN758 B83L)

A survey for the designer, the foundryman, and the metallurgist. Compositions and present applications in industry. Scrap metal markets.

5749* (Polish.) Investigations of the Properties and Structure of Cu-Si-Zn Casting Alloys. **Badania własności i struktury odlewniczych stopów Cu-Si-Zn.** Z. Górny and K. Rutkowski. *Prace Instytutu Odlewnictwa*, v. 4, no. 4-54, 1955, p. 243-260.

Chemical composition and properties of these alloys which are most useful with regard to economy and application.

5750 Vacuum Melted Alloys for Forged Parts. W. W. Dyrkacz and E. E. Reynolds. *Product Engineering*, v. 28, Feb. 1957, p. 143-145.

Advantages and limitations of consumable electrode and induction heating processes; effect on cleanliness, segregation, and elevated temperature properties; relative costs and growing fields of use.

5751 Regional Technical Meetings. 515 p. 1956. American Iron and Steel Institute, New York. (TS300 Am35ta Vis.)

A collection of 27 papers on a wide variety of subjects, including recovery of Mn, increasing open-hearth furnace production, H embrittlement, flow of metal and brittle fracture, and the use of steel in atomic energy plants.

5752* (German.) Applications of Radioactive Isotopes in the Metallurgical Industry. **Anwendungen von radioaktiven Isotopen in der Eisenhüttenindustrie.** H. Krainer and E. Krainer. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 22, Dec. 1956, p. 402-413.

The radioactive isotope of phosphorus, P_{32}, was used to discover phosphorus segregation in a Ni-Mo steel and the modifications caused by hot-working and thermal treatment.

5753 More Work for Magnesium. *Steel*, v. 140, Jan. 28, 1957, p. 105-108.

Its superior machinability, high damping factor, stiffness and fatigue resistance are attracting more users. Some case histories are illustrated.

5754 (German.) Steel Wire Products. **Stahldrahterzeugnisse. v. I-II.** 340 and 315 p. 1956. Verlag Stahleisen M.B.H., Düsseldorf. (TS270 V58s)

A comprehensive description of the many articles made of wire. Materials used; machines and methods applied to wire processing in many sorts of wire products such as cables, welding wires, structural products, reinforced-concrete bars, accessory parts for power vehicles, needles, and chains.

5755 Application of Chemical Thermodynamics to the Study of Alloy Formation. W. E. Wallace, R. S. Craig, C. A. Krier, W. Saba, and M. G. Zabetakis. *University of Pittsburgh (U. S. Atomic Energy Commission)*, NYO-6330, Dec. 1956, 7 p. (UF767 U3ny Contin.)

Progress report on heat capacity determinations for Zn, Mg, and Na_2K.

5756* (Polish.) Tungsten—Production, Properties, and Applications. **Wolfram, jego wytwarzanie, własności i zastosowanie.** Stanisław Stolarz. *Wiadomości Hutnicze*, v. 12, Nov. 1956, p. 340-346.

Obtaining and reducing WO_3; pressing and sintering W; plastic deformation at elevated temperatures; properties and applications.

See also: **4990** (uses of Pt in chemical plants); **4991** (uses of Al in chemical plants); **5473** (capacity of steelmaking plants); **5483** (steelmaking developments in 1956); **5697** (materials for ball bearings).

METALS—CORROSION

5757* (French.) Effects of the Curie Point on the Oxidation of Magnetite (Fe_3O_4), Iron, Nickel and Some Iron Alloys. **Influence du point de Curie sur l'oxydation de la magnétite Fe_3O_4, du fer, du nickel et de certains alliages de fer.** Laurent Seigneurin and Hubert Forestier. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2052-2054.

By oxidizing Fe, Ni, Magnetite, and Fe alloys near the Curie point some anomalies of chemical reactivity are shown.

5758* (French.) High Temperature Air Oxidation of Kroll Zirconium. **Etude de l'oxydation a chaud du zirconium Kroll dans l'air.** Jean Hérenguel, Donald Whitwham, and Jacques Boghen. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2060-2063.

Studies of metal samples exposed to air between 400 and 900 C for times of 3 min. to 24 hr.

5759 Selection of Rust Inhibitors to Meet Service Requirements. A. J. Freedman, A. Dravnieks, W. B. Hirschmann, and R. S. Cheney. *Corrosion*, v. 13, Feb. 1957, p. 89T-94T.

The choice of general type of rust inhibitor (aqueous- or oil-soluble) as well as the particular compound to be used in any case, should be based on accurate test data such as that obtained from the Indiana Conductometric Rusting Test described here.

5760 Study of a Size Effect in Galvanic Corrosion. James T. Waber. *Corrosion*, v. 13, Feb. 1957, p. 95T-102T.

Distribution of potential within a corrodent was analyzed using several geometric arrangements of electrodes.

5761 Use of High Silicon Cast Iron for Anodes. *Corrosion*, v. 13, Feb. 1957, p. 103T-107T.

Data indicate that iron anodes can be expected to perform satisfactorily both with and without coke breeze ground beds and that economics of installation without ground beds frequently is good.

5762 The Use of Graphite as Duct Anodes. A. L. Ayres. *Corrosion*, v. 13, Feb. 1957, p. 108T-110T.

Presents economics of the system from a field test.

5763 Bibliographies of Corrosion Products. *Corrosion*, v. 13, Feb. 1957, p. 111T-121T.

Selected abstracts arranged chronologically on the identification and composition of corrosion products on stainless steels, Zn, Zr, Ti, Fe, and steel.

5764 An Impressed Current Cathodic Protection System Applied to a Submarine. E. E. Nelson. *Corrosion*, v. 13, Feb. 1957, p. 122T-124T.

A system using Pt-clad Cu anodes on neoprene shields.

5765 Cathodic Protection on an Active Ship Using a Trailing Platinum-Clad Anode. H. S. Preiser and F. E. Cook. *Corrosion*, v. 13, Feb. 1957, p. 125T-131T.

The advantages of the trailing anode over existing hull-mounted anode systems; its future possibilities.

5766 Casing Corrosion in the Petroleum Industry. Jack L. Battle. *Corrosion*, v. 13, Feb. 1957, p. 132T-138T.

Points out the geographical areas in which the problem of casing corrosion is most troublesome and lists the generally accepted causes and means of preventing and repairing such failures.

5767 Measurement of the Instantaneous Corrosion Rate by Means of Polarization Data. R. V. Skold and T. E. Larson. *Corrosion*, v. 13, Feb. 1957, p. 139T-142T.

Steel and cast iron specimens were tested in 3000 ohm-cm. waters; potentials were measured by a multicombination meter.

5768 Lead Cable Sheath Corrosion Under Cathodic Protection Conditions. Walter H. Bruckner and Ray M. Wainwright. *Corrosion*, v. 13, Feb. 1957, p. 143T-148T.

5769 Cathodic Protection for Small Shipping. M. G. Duff and I. D. G. Graham. *Corrosion Technology*, v. 4, Jan. 1957, p. 9-12.

Impressed current systems; magnesium and other anodes; applications in wooden and steel vessels.

5770 Study of the Cathodic Reduction of Oxide Films on Iron. I. Reduction of Alpha-Fe_2O_3 Films. H. G. Oswin and M. Cohen. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 9-16.

Apparatus and technique. Measurements of the reduction efficiency in buffered and unbuffered electrolytes. Effects of *p*H of the electrolyte, dissolved O current density, and film thickness.

5771 Uranium-Aluminum Alloy Dissolution. R. G. Wymer and R. E. Blanco. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 59-61.

Use of boiling aqueous solutions of HNO_3, which contained $Hg(NO_3)_2$ as a catalyst, and of NaOH as dissolvents for recovery of U.

5772 Corrosion Resistance of Copper and Copper-Base Alloys. A. I. Heim. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 79A-80A.

Review of processes and mechanisms in pitting, dezincification, corrosion-fatigue, stress-corrosion cracking, and galvanic corrosion. (To be continued.)

5773 (German.) Iron Corrosion and Its Prevention. **Die Korrosion des Eisens und ihre Verhütung.** Phil. Heinrich Klas and Heinrich Steinrath. 504 p. 1956. Verlag Stahleisen M.B.H., Düsseldorf. (TA467 K66k)

A study is offered of corrosion and corrosion prevention in pure iron, and alloyed and unalloyed ironwork products. Other metals were examined in relation to their corrosion behavior as a help in understanding and preventing iron corrosion.

5774* (Swedish.) Stress Corrosion Cracking of Austenitic Stainless Steels in Low Pressure Steam and Hot Water. **Spänningskorrosion hos austenitiska rostfria stål i lågtrycksånga och varmvatten.** Sven Brennert and Helmer Nathorst. *Jernkontorets Annaler*, v. 140, no. 11, 1956, p. 839-853.

Experiments show that this stress corrosion is caused by stresses of sufficient magnitude, presence of oxygen, and conditions such that a strong, hot chloride solution is formed.

5775 (German.) Metal and Metal Alloy Oxidation. **Oxydation von Metallen und Metallegierungen.** K. Hauffe. 389 p. 1956, Springer-Verlag, Berlin. (TA467 H29o)

Critically studies oxide scale and oxidation processes conditioned by diffusion, phase boundary reactions, and temperatures. Related theories are considered.

5776 (Italian.) Evaluation of Water Corrosivity. **Considerazioni sulla valutazione della corrosività delle ecque.** G. Bombara and F. Gianni. *Metallurgia Italiana*, v. 48, Nov. 1956, p. 503-512.

Tests are described for differentiating waters in relation to corrosivity. The variation of conductance in the curves of cathodic polarization is the best method.

5777 Sodium Hydroxide Pump Loops. N. E. Miller and E. M. Simons. Paper from "Nuclear Engineering". Pt. IV. Chemical Engineering Progress Symposium Series No. 19. v. LII. American Institute of Chemical Engineers. p. 113-116. (QC776 Am35n)

Design and operation of small laboratory loops for investigating the influence of temperature, thermal gradient, and flow velocity on the corrosion of Ni by circulating NaOH. Low maximum temperature and small thermal cycles are required for a reasonable lifetime of a NaOH-cooled reactor.

5778 Corrosion Rates Directly Measured by New Resistance Method. D. H. Stormont. *Oil and Gas Journal*, v. 55, Jan. 21, 1957, p. 85-87.

By means of a probe installed in the corrosive system, the electrical resistance of the whole specimen is indicated on a meter.

5779* (Polish.) Corrosion of Zinc Casting Alloys of the ZnAl Type. **Korozja odlewniczych stopów cynku typu ZnAl.** J. Kamecki and J. Romański. *Prace Instytutu Odlewnictwa*, v. 4, no. 4-54, 1955, p. 223-232.

Tendency to aging; selective intercrystalline and normal electrochemical corrosion in a neutral salt solution.

5780 Investigation of Hydrofluoric Acid as a Corrosion Inhibitor for Fuming Nitric Acids. M. J. Keeler and E. F. Knoll. *Wright Air Development Center, WADC Technical Report* 56-310, 1956, 165 p. (TL507 Un3.18w Vis.)

Corrosion rates of 6061-T6 Al and Type 347 stainless steel were generally reduced by a factor varying from about 10 to 100, when an initial HF content of approximately 0.75% by wt. was employed.

5781* (Russian.) A New Method of Studying the Atmospheric Corrosion of Metals. **Novyi metod issledovaniia atmosfernoi korrozii metallov.** T. I. Lukonina, K. A. Zhigalova, and I. L. Rozenfel'd. *Zavodskaia Laboratoriia*, v. 22, Dec. 1956, p. 1463-1467.

An arrangement for producing an atmosphere of given composition with specific moisture content by passing the air through moistened salts.

See also: **5232** (reaction between Ni and NaOH); **5280** (reaction of Al and Mg with N); **5378** (electrical behavior of the system Cr-H_2O); **5993** (effect of diphenyl on corrosion).

METALS—EXTRACTION AND REFINING

5782 More Iron Without More Furnaces. Charles M. Squarcy and Richard J. Wilson. *Blast Furnace and Steel Plant*, v. 45, Jan. 1957, p. 53-62.

Advantages and limitations of methods for improving pig iron production. Methods giving the most tangible results were the use of sized ore, sinter, quality coke, and high top pressure.

5783* Exothermics Raise Ingot Yields. G. N. Cherry. *British Steelmaker*, v. 23, Jan. 1957, p. 12-15.

Exothermic feeding results in more usable steel per ingot and consequently is quite economical.

5784 Cyclone Reactor: In Goes Ore—Out Comes Steel. *Chemical Week*, v. 80, Jan. 26, 1957, p. 94-96.

British-developed "Cyclosteel" process telescopes entire steelmaking procedure into one step. By making steel directly from the ore, the process bypasses the coke oven, blast furnace, and the open-hearth, electric furnace, or Bessemer converter.

5785 Separation by Stages—New Bid for Pure Zirconium. *Chmical Week*, v. 80, Feb. 2, 1957, p. 58-59.

Hafnium separation by the tetraiodide method may soon be replaced by a tetrachloride process.

5786 How to Pull Manganese From Poor Ore. *Chemical Week*, v. 80, Feb. 9, 1957, p. 40-42, 46, 48.

Procedures used in converting low-grade Mn ore into ferromanganese at costs comparable with those achieved using high-grade material.

5787 Preparation of Zirconium and Hafnium Metals by Bomb Reduction of Their Fluorides. O. N. Carlson, F. A. Schmidt, and H. A. Wilhelm. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 51-56.

Method entails a bomb reduction of ZrF_4 or HfF_4 with Ca to form a massive Zn alloy. The Zn is removed by heating in vacuum to yield a sponge of Zr of Hf metal.

5788* (Polish.) Applying the Ionic Slag Theory to Explain the Qualitative Character of the Reaction Between Slag and Metal. **Zastosowanie jonowej teorii żużli do jakościowego wyjaśnienia reakcji między żużlem a metalem.** Andrzej Staronka. *Hutnik*, v. 23, Oct. 1956, p. 375-379.

Attempts to show that an ionic theory gives a better explanation of the quantitative and qualitative factors in the reaction than does a molecular theory.

5789 (French.) Comparison of Various Methods for Fuel Oil Atomization in an Open Hearth Furnace. **Comparison de différents modes de pulvérisation du mazout dans un four Martin.** G. Husson, A. Peters, G. Jomier, and R. Kissel. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, Dec. 1956, p. 256-277.

The results of different methods of combustion and the working characteristics are described. A jet with high turbulence was recommended.

5790* (Russian.) Effect of Manganese on the Activity and Solubility of Oxygen in Liquid Iron. **Vliianie margantsa na aktivnost' i rastvorimost' kisloroda v zhidkom zheleze.** V. V. Averin, R. A. Karasev, A. Iu. Poliakov, and A. M. Samarin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 11, Nov. 1956, p. 52-57.

5791* (Russian.) High Purity Elementary Silicon. **Elementarnyi kremnii vysokoi chistoty.** N. N. Murach. *Khimicheskaia Nauka i Promyshlennost*, v. 1, no. 5, 1956, p. 492-495.

Preparation by purification of technical Si is compared with ten methods of direct preparation.

5792* (Russian.) Progress in Titanium Production. **Puti razvitiia proizvodstva titana.** G. A. Meerson. *Khimicheskaia Nauka i Promyshlennost*, v. 1, no. 5, 1956, p. 496-504.

Technology production of sponge and ductile Ti.

5793 Enriched Blast in Basic Steelmaking. Pierre Coheur and H. Kosmider. *Metal Progress*, v. 71, Jan. 1957, p. 67-72.

Europeans find that the use of O-enriched blast with or without supplementary O through the converter's mouth speeds the steelmaking process, consumes more scrap, utilizes offgrade pig iron, and broadens the applications of the steel produced.

5794* The Manufacture of Special Steels. G. Reginald Bashforth. *British Steelmaker*, v. 23, Feb. 1957, p. 42-48.

Use of instruments in open-hearth furnace control; hearth construction and maintenance; melt and slag control; charging; choice of deoxidizers; steel for deep drawing.

5795* (German.) Steel Production by the "LD" Process. **Die Stahlerzeugung nach dem "LD"-Verfahren.** J. Eibl. *Ö.Z.E., Österreichische Zeitschrift für Elektrizitatswirtschaft*, v. 9, Dec. 1956, p. 551-555.

Historical study of high quality steel production by blowing pure O on a metal bath in a pear-shaped crucible. Metallurgical characteristics; recent developments; present output.

5796* (Russian.) Use of Oxygen in 370 Ton Open Hearth Furnaces. **Osvoenie raboty s kislorodom na 370-t martenovskikh pechakh.** I. A. Shmonin and A. P. Klincherov. *Stal'*, v. 16, Dec. 1956, p. 1076-1079.

Thermal and oxidation effect of introducing O into the flame. Method of use and characteristics. Experimental data.

5797 Oxygen Through the Roof. *Steel*, v. 140, Feb. 11, 1957, p. 112, 114, 116.

New torch assembly and roof construction produce a workable O system for the open-hearth.

5798 Oxygen in British Steelmaking. D. J. O. Brandt. *Steel Review*, no. 5, Jan. 1957, p. 43-48.

A review of significant post-war changes in steelmaking brought about by the increasing availability of low-cost O.

5799* (Polish.) Problems Connected With the Construction of Blast Furnaces. **Niektóre zagadnienia z dziedziny konstrukcji wielkich pieców.** St. Dyakowski. *Wiadomości Hutnicze*, v. 12, Nov. 1956, p. 327-332.

Problems of, and suggestions for, improvements in carbon refractories, bases, cooling, and in using a venturi gas cleaner.

See also: **5044** (analysis in steel plants); **5373** (power for arc furnaces); **5821** (cast-iron ingot molds).

METALS—FINISHING, POLISHING, AND CLEANING

5800 Solvent Degreasing — What Every User Should Know. C. E. Kircher. *ASTM Bulletin*, no. 219, Jan. 1957, p. 44-49.

To evaluate testing of degreasing-grade trichloroethylene requires a knowledge of the solvent, its stabilization, and its industrial use.

5801 Shot Blasting and Shot Peening of Light Alloys. F. Flusin. *Electroplating and Metal Finishing*, v. 10, Jan. 1957, p. 15-17.

Advantages and disadvantages of various types of sand and shot; vapor blasting; blasting with various vegetable products such as nut shells and fruit stones.

5802 Technical Developments of 1956. Nathaniel Hall. *Metal Finishing*, v. 55, Jan. 1957, p. 42-52A.

Covers the literature on cleaning, pickling, polishing, anodizing and plating Al, metallic coatings, electroforming, metalizing, conversion films, testing and control, and waste treatment.

5803 Metal Polishing With Set-Up Wheels. R. S. Burt. *Metal Finishing*, v. 55, Feb. 1957, p. 52-55.

Types of adhesives and abrasives; preparation of wheel for set up; paste heading, drying, and breaking up of wheel surface.

5804* (French.) Degreasing Metallic Surfaces. **Le dégraissage des surfaces métalliques.** A. Bayon. *Métaux, Corrosion-Industries*, v. 31, Dec. 1956, p. 513-517.

Surveys methods for cleaning with simple or combined solvents, bath treatments with chemical solutions, and electrolytic or mechanical action. Ultrasonic cleaning.

5805 Control of Pickling Prior to Galvanizing Reduces Waste. John L. Collins. *Products Finishing*, v. 21, Feb. 1957, p. 43-46.

Review of ways to reduce H_2SO_4 consumption. The most important step is to pickle slowly and at low temperatures.

5806* (German.) Diamond as a New Grinder and Polisher. **Diamant als neues Schleif- und Poliermittel.** Rudolf Vogel. *Zeitschrift für Metallkunde*, v. 47, Dec. 1956, p. 775-777.

Application of method useful for soft and hard alloys.

See also: **5398** (metal polishing procedures); **5836** (cleaning of castings).

METALS—FOUNDRY PRACTICE

5807 Investment Casting Bids for Big Role in Jet Engines. Dean K. Hanink. *Aviation Age*, v. 27, Feb. 1957, p. 94-99.

Current applications.

5808* (Italian.) The Co_2 Process. **Il processo al CO_2.** Mario Bertacchini. *Fonderia*, v. 5, Dec. 1956, p. 611-620.

The process of letting a current of CO_2 pass through a core made of siliceous sand mixed with a sodium silicate binder.

5809* (Italian.) Mulling Times and Mulling Production Per Hour. **Tempi di molazzatura e produzione oraria delle molazze di fonderia.** Giovanni Mugnai. *Fonderia*, v. 5, Dec. 1956, p. 625-630.

A study of mulling machine production, including operating cycle, power necessary, energy absorbed, and efficiency.

5810* (French.) Treat Castings by Introducing Gas in the Molten Metal in Order to Reduce the Tendency Toward Brittleness and to Obtain a Stronger Casting. **Traitement de la fonte par barbotage de gaz en vue de la diminution de la tendance a la trempe et de l'obtention de fonte résistante.** Georges Blanc and Nicolas Volianik. *Fonderie*, no. 130, Nov. 1956, p. 439-455.

The method used in introducing gases in the molten metal was found to have an important effect on the properties of the casting. Tests were performed on gray cast iron with H, N, and other gases.

5811* (French.) Practical Degassing Methods Used With Light Alloys. **Procédés pratiques de dégazage des alliages légers.** Claude mascré and André Lefebvre. *Fonderie*, no. 131, Dec. 1956, p. 496-508.

Natural degassing as an underrated but valuable process is stressed. Description of a process using N with no harmful effects on light alloy melts; comparison with the hexachloroethane degassing method.

5812 Making Ship Propellers With CO_2 Molds and Cores. Robert H. Herrmann. *Foundry*, v. 85, Feb. 1957, p. 104-109.

Mold gassing; coremaking; sand formulation; metals used.

5813 How to Pour a Mold. Morris Gittleman. *Foundry*, v. 85, Feb. 1957, p. 110-111.

Recommendations for overcoming deficiencies in pouring practice and control.

5814 Molding Practice in the Brass Foundry. Harry St. John. *Foundry*, v. 85, Feb. 1957, p. 112-115.

Centrifugal, investment and metal mold casting; organic binders; shell molding.

5815 Continuous Air Blast Control Improves Cupola Operation. E. J. Parker. *Foundry*, v. 85, Feb. 1957, p. 116-119.

Continuous cupola blast control offers possibilities of controlled metal analyses, a fast melting rate, a low coke-to-iron ratio, and a fluid slag.

5816 Closures for Coreboxes. W. Hagedorn. *Foundry*, v. 85, Feb. 1957, p. 123-125.

Examples of the types available and their applications.

5817 Green-Sand Moulding of Large Steel Castings. Charles W. Briggs. *Foundry Trade Journal*, v. 102, Jan. 10, 1957, p. 35-43.

Sand preparation; binders and other additions; mold and core technology; sand reclaim.

5818 "Compo" and Chamotte Moulding. R. Wright. *Foundry Trade Journal*, v. 102, Jan. 17, 1957, p. 69-73.

Molding, painting, and drying techniques. Ingredients of compo and mold coatings. Differences between compo molding and the American practice of using bonded silica sands for heavy steel castings.

5819* (German.) Limestone Carbon Dioxide in Cupola Furnace. **Die Kalksteinkohlensäure in Kupolofen.** Hans Jungbluth and Alois Dahlmann. *Giesserei*, v. 44, Jan. 3, 1957, p. 7-13.

Various methods of eliminating CO_2. Nomograms and slide rule methods for calculating CO_2 and blast volume.

5820* (German.) Effect of Mold Material and Alloy on the Solidification of Light Metal Castings. **Einfluss des Formstoffes und der Legierung auf die Erstarrungszeit von Leichtmetall-Gussstücken.** Eberhard Hesse. *Giesserei*, v. 44, Jan. 3, 1957, p. 13-17.

Effect of alloy composition, mold material, mold temperature, and sand properties on solidification time.

5821* (Czech.) Materials and Processes for Making Ingot Molds for Steel. **Mateiál pro ocelářské kokily a připominky k jeho zpracováni.** Josef Přibyl and Břetislav Zeman. *Hutník*, v. 6, Oct. 1956, p. 296-299.

Gray cast iron is the most satisfactory material for making ingot molds.

5822 Cast Titanium Gets Set for Commercial Use. *Iron Age*, v. 179, Feb. 7, 1957, p. 102-105.

Castings with no surface contamination are currently available. Baked sand molds and new alloys are discussed.

5823 (English and Spanish.) **The Design of Diecastings and Diecasting Dies. III.** W. M. Halliday. *Machinery Lloyd (Overseas Ed.)*, v. 29, Jan. 5, 1957, p. 70-77.

Consideration of problems of coring holes in the casting.

5824* (Dutch.) Hydrogen in Cast Copper, Nickel, and Aluminum Alloys. **Waterstof in gegoten koper-, nikkel- en aluminiumlegeringen.** H. Boswinkel. *Metalen*, v. 11, Dec. 31, 1956, p. 559-568.

In a solid or fused metal the solubility of H becomes greater as the temperature increases, and it decreases strongly during the solidification period. Methods of preventing gas porosity.

5825* A Review of Shell Moulding and CO_2 Processes. J. L. Rice. *Metalworking Production*, v. 101, Jan. 4, 1957, p. 3-9.

Advantages, limitations, relative competitive positions, and suggestions for future developments.

5826* Soluble Wax Cores Solve the Impossible. C. W. Schwartz. *Modern Castings*, v. 31, Feb. 1957, p. 56-57.

Wax-mica material makes accurate cavity cores and forms difficult contours for investment castings.

5827* Charting the Way to Cupola Quality Control. Morris Gittleman. *Modern Castings*, v. 31, Feb. 1957, p. 58-60.

Five simple records on the operation of the cupola are the foundation of gray iron quality control.

5828* (Polish.) Castability of Foundry Alloys. **Lejność stopów odlewniczych.** Włodzimierz Pessel. *Przeglad Odlewnictwa*, v. 6, Dec. 1956, p. 362-368.

The concept of fluidity of a metal. Factors affecting castability; means of determining castability; taking and evaluating samples.

5829* Ceramic Investment Shells Give High-Quality Castings. Nicholas J. Grant and Philip Manganaro. *Tool Engineer*, v. 38, Feb. 1957, p. 109-113.

A method of applying "Glascast" powder as an investment slip or slurry directly on a disposable wax pattern.

5830 Transactions of the American Foundrymen's Society. Joseph E. Foster, editor. v. LXIV. 730 p. 1956. American Foundrymen's Society, Des Plaines. (TS200 Am35t Vis.)

Consists of the 94 papers presented at the 60th annual meeting on May 3-9, 1956.

5831 Use of Pig Iron in Iron Foundries (With Particular Attention to Specifications, Prices, Secondary Elements, and "Heredity"). H. W. Lownie, Jr. Paper from "Transactions of the American Foundrymen's Society". p. 104-124. (TS200 Am35t Vis.)

Covers pig iron classification, analysis, principal uses, prices, effects of primary and secondary elements, nodular and malleable iron castings manufacture, and pig iron "heredity".

5832 Modifications in Vertical-Gating Principles. K. R. Grube, R. M. Lang, and J. G. Kura. Paper from "Transactions of the American Foundrymen's Society". p. 54-61. (TS200 Am35t Vis.)

Further modifications were made on an improved vertical gating system described earlier, to improve the system without increasing the degree of turbulence within the mold cavity or without increasing the probability of getting dirt or dross into the castings.

5833 Precision Steel Castings for Aircraft Use. *U. S. Department of Commerce Office of Technical Services*, PB121148, Apr. 1956, 55 p. (T21 Un3r Contin.)

Government survey of the field of high-strength precision casting techniques with particular emphasis on steel concludes that present activities are insufficient and uncoordinated.

5834* (Russian.) Articles Made of Non-Ferrous Alloys by Pressing Liquid Metal. **Izgotovlenie detalei iz tsvetnykh splavov pressovaniem zhidkogo metalla.** I. A. Nenaezdnikaov. *Vestnik Mashinostroeniia*, v. 36, Dec. 1956, p. 60-64.

Construction and operation of a press for making plumbing fittings. Claims a 45 to 50% saving in metal and a 30 to 35% saving in labor.

See also: **5567** (properties of metallurgical coke); **5740** (gray iron specifications); **5841** (production of malleable iron); **5860** (modulus of elasticity of cast-iron melts); **5920** (snagging of castings); **6174** (foundry air pollution control); **6175** (foundry ventilation).

METALS—HEAT TREATMENT

5835* Modern Heat Treatment. Adrian A. Hofman. *Australasian Engineer*, v. 49, Dec. 1956, p. 47-55.

Time-temperature-transformation curves and modern heat treatment methods based on them; the effect of composition and other factors on their shape and location.

5836 Integrated Setup Cleans and Stress Relieves Castings. W. G. Patton. *Iron Age*, v. 179, Feb. 7, 1957, p. 112-113.

Automatic transmission plant ties stress-relieving furnace in with Kolene salt bath, thus eliminating burned-in sand, heat-treat scale, and distortion during or after machining.

5837* (Russian.) New Efficient Carburizer in Gas Cementation. **Novyi patsional'nyi karbiurizator dlia gazovoi tsementatsii.** A. T. Kalinin, M. N. Kuniavskii, and A. Ia. Zaitseva. *Metallovedenie i Obrabotka Metallov*, no. 11, Nov. 1956, p. 40-49.

Studies prerequisites for the selection of the best composition of carburizers. Various liquid carburizers were examined for gas cementation.

5838* The Application of Induction Heating to the Surface Hardening of Steel. J. Hamilton. *Metallurgia*, v. 55, Jan. 1957, p. 3-7.

Principles of induction heating; practical application; generating equipment; typical installations.

5839 Instrumentation in the Heat-Treatment of Steel. II. Importance of Instrumentation. W. F. Coxon. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 7-10.

Methods of controlling the important variables for successful heat-treatment.

5840 Heat-Treatment of Ligh Alloys. T. R. G. Williams. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 34-38.

Factors which govern the choice of equipment, and thermal practice. Existing furnace designs are compared and possible future trends suggested.

5841* Planning for Heat Treating in Malleable Iron Foundries. *Modern Castings*, v. 31, Feb. 1957, p. 39-54.

Metallurgical practice for production of white iron; selection of malleable heat treating furnaces, fuels, and auxiliary control equipment.

5842* (German.) Structure and Magnetic Properties of Permanent Magnet Alloys During Isothermal Precipitation Hardening. **Gefüge und magnetische Eigenschaften von Dauermagnetlegierungen während der isothermen Ausscheidungshärtung. II.** Process of Separation and the Significance of the Pattern of the Magnetic Properties. **Der Vorgang der Entmischung und Deutung des Verlaufs der magnetischen Eigenschaften.** Eginhart Biedermann and Eckart Kneller. *Zeitschrift für Metallkunde*, v. 47, Dec. 1956, p. 760-774.

The course of the saturation magnetization, the remanence, the constant of magnetic viscosity, the electrical conductivity, and the mechanical hardness were measured as a function of aging-time during isothermal hardening of some Cu-Ni-Fe-alloys.

See also: **5914** (glass baths for heating billets).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

5843* Selection of Testing Locations in Aluminum Die Forgings. Ihor E. Suchoversky. *Aeronautical Engineering Review*, v. 16, Jan. 1957, p. 29-34.

Mechanical property tests must be carried out strictly in relation to the grain axes in order that representative, comparable, and predictable results may be obtained regardless of the shape and type of the forging.

5844* (German.) 475°C Embrittlement of Iron-Chromium Alloys. **Untersuchung zur 475° Versprödung von Eisen-Chrom-Legierungen.** Karl Bungardt and Wolfgang Spyra. *Archiv für das Eisenhüttenwesen*, v. 27, Dec. 1956, p. 777-786.

Studies of changes of hardness, electrical resistance, expansion, thermal stress, and magnetization in Fe-Cr alloys with 18 to 45% Cr during phase transformation at 475 C.

5845 Effect of Surface Finish on the Fatigue Strength of Titanium Alloys RC 130B and Ti 740A. G. M. Sinclair, H. T. Corten, and T. J. Dolan. *ASME, Transactions*, v. 79, Jan. 1957, p. 89-96.

Machining and finishing operations introduced varying degrees and varying depths of cold work in the surface layers. Fatigue strength for lifetimes exceeding 2 x 10^7 cycles varied according to the hardness of the surface layer. Roughness also influenced fatigue strength but to a much lesser degree.

5846 Residual Stresses in Cold Extruded Aluminum. J. Frisch and E. G. Thomsen. *ASME, Transactions*, v. 79, Jan. 1957, p. 155-160.

Stresses on the surface of a bar extruded from 1100-O (2S-0) Al were determined from the axially relaxed stresses in the billet during extruding.

5847* Experiments on the Arrest of Brittle Cracks in 36-in. Wide Steel Plates. A. A. Wells, P. H. R. Lane, and G. Coates. *British Welding Journal*, v. 3, Dec. 1956, p. 554-570.

Brittle cracks were initiated in plain plates, and in composite specimens, both welded and riveted, in order to determine relative crack-arresting properties. Tests were carried out with a special machine in which loads of up to 600 tons can be generated by means of oil-filled pressure capsules.

5848* Hydrogen Embrittlement of Steel and Its Relation to Weld Metal Cracking. H. G. Vaughan and M. E. de Morton. *British Welding Journal*, v. 4, Jan. 1957, p. 40-61.

Initiation of fissures in weld metal was related to the known effects of H on mechanical properties of steel. Microscopic examination confirmed that a pressure build-up of H may occur at interfaces in the ferritic matrix, the resultant deformation giving rise to strains which induce local cleavages.

5849 Mechanical Properties of Reactor-Grade Beryllium at Elevated Temperatures. R. G. O'Rourke, J. N. Hurd, K. G. Wikle, and W. W. Beaver. *Brush Beryllium Company (U. S. Atomic Energy Commission)*, COO-312, Aug. 1956, 142 p. (UF767 Un3.1co Contin.)

Covers temperature range of 800 to 1500 F and strain rates of 0.001 to 0.1-in. per in. per min.

5850 The Effects of Grain Boundaries on the Plastic Deformation of Zinc Crystals. G. B. Craig and B. Chalmers. *Canadian Journal of Physics*, v. 35, Jan. 1957, p. 38-47 + 2 plates.

The tensile plastic deformation of single-crystal and tricrystal specimens of Zn was investigated by analysis of the external change in shape of the specimens, and changes in X-ray diffraction patterns.

5851* (French.) Electronic and Ionic Properties of Transition Metals. **Propriétés électroniques et ioniques des métaux de transition.** André Roos. *Chimie & Industrie*, v. 76, Nov. 1956, p. 1032-1046.

The experimental study of anodic oxidation makes it possible to measure an "ionic diffusion coefficient" of metals by a new method, based on the continuous measure of the thickness of the oxide film by means of a photoelectric cell.

5852* (French.) Factors of Reflection of Thin Gallium Sheets. **Facteurs de réflexion du gallium en lames minces.** Jean Tortosa. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2031-2034.

Optical and electrical properties of thin Ga sheets were studied in vacuum.

5853* Selecting Copper and Its Alloys. IV. Mechanical Properties. Pt. II. *Copper & Brass Bulletin*, no. 180, Feb. 1957, p. 8-9.

Gives representative average strength values for annealed tempers and the hard (rolled or drawn) temper.

5854 Embrittlement of 12 Percent Chromium Steel Thermocouple Nozzles on a Thermofor Catalytic Cracking Unit Reactor. H. Howard Bennett. *Corrosion*, v. 13, Feb. 1957, p. 87t-88t.

The point of failure had been subjected to a temperature of from 850 to 1000 F for approximately 100,000 hrs.

5855* (Russian.) Study of the Mechanism of Boron Effect by the Internal Friction Method. **Izuchenie mekhanizma vliianiia bora metodom vnutrennego treniia.** M. V. Pridantsev, O. N. Meshcherinova, and Iu. V. Piguzov. *Doklady Akademii Nauk SSSR*, v. 111, Nov.-Dec. 1956, p. 98-101.

Impact ductility of technically pure Fe with and without B. Temperature dependence of internal friction after preheating with various B contents.

5856 Factors Involved in Brittle Fracture. M. W. Lightner and R. W. Vanderbeck. Paper from "Regional Technical Meetings". American Iron & Steel Institute, New York. p. 427-483. (TS300 Am35ta Vis.)

Transition temperatures; role of weldments; temperature, strain rate, and state of stress; composition and deoxidation practice; microstructure; hot rolling practice; toughness requirements in different applications.

5857 (Italian.) Fatigue Resistance of Metals. **Resistenza a fatica dei metalli.** 333 p. 1950. Instituto Siderurgico Finsider. (TA460 B32ptr)

A comprehensive review, written for aeronautical and navy designers and technical personnel, of data gathered from various disperse sources on prevention of fatigue ruptures.

5858* (French.) Considerations on the Modulus of Elasticity of Castings and Their Elastic Behavior in General. **Considérations sur le module d'élasticité des fontes et leur comportement élastique en général.** Paul Le Rolland and Elisabeth Plénard. *Fonderie*, no. 130, Nov. 1956, p. 427-438.

The modulus of elasticity as a criterion of quality in castings; elastic behavior of solids in general; the stress-strain diagram of a casting.

5859* (French.) Results Obtained in Testing Castings Containing Copper. **Résultats d'essais sur la fonte au cuivre.** Pierre Détrez. *Fonderie*, no. 130, Nov. 1956, p. 456-463.

Mechanical properties of cast iron containing up to 3% of Cu.

5860* (French.) Various Methods of Measuring the Modulus of Elasticity of Melts and Comparison of Results. **Mesure du module d'élasticité des fontes par diverses méthodes et comparaison des résultats.** Paul Le Rolland and Élisabeth Plénard. *Fonderie*, no. 131, Dec. 1956, p. 477-495.

Comparative study of test methods. The disagreement in results obtained with cast iron and the absence of variance in the case of other metals were interpreted.

5861 Flow and Fracture Characteristics of Binary Wrought Magnesium-Lithium Alloys. M. W. Toaz and E. J. Ripling. *Institute of Metals, Journal*, v. 85, Dec. 1956, p. 137-144 + 2 plates.

Additions of Li to Mg generally improved tensile ductility at sub-room temperature, while reducing tensile strength. These property changes were continuous with increasing Li content whether the structure was hexagonal, mixed hexagonal and cubic, or completely cubic, with the exception of a range of temperatures in which the cubic alloy suffered some embrittlement.

5862 The Cold-Rolled Texture of Hafnium. D. S. Eppelsheimer and D. S. Gould. *Institute of Metals, Journal*, v. 85, Dec. 1956, p. 158-160.

Arc-melted crystal-bar Hf containing 3% Zr was given 95% reduction in thickness by cold rolling to 0.004 in. strip. Specimens showed a (0001) (1010) texture rotated 25° toward the transverse direction about an axis in the rolling direction.

5863 A New Look at Temper Brittleness. G. K. Bhat. *Iron Age*, v. 179, Jan. 24, 1957, p. 73-77.

Causes and prevention; effect on properties; effects of alloying elements.

5864* (Russian.) Plastic Deformation of Isotropic Metal Under Complex Load. **O plasticheskikh deformatsiiakh izotropnogo metalla pri slozhnom nagruzhenii.** A. M. Zhukov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 12, Dec. 1956, p. 72-87.

Decrease of impact ductility as result of heat treatment does not change the plastic properties under complex stress loads. The theory of small viscous-plastic deformation is in accordance with experimental results.

5865* Upper Nose Temper Embrittlement of a Ni-Cr Steel. L. D. Jaffe and D. C. Buffum. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 8-16.

Temper embrittlement was investigated both isothermally and with temperature changes. Embrittlement was most rapid in two temperature ranges: 490 to 550 C and just below the Ac_1, near 675 C.

5866* Free Energy of Formation of Mn_7C_3 From Vapor Pressure Measurements. C. Law McCabe and R. G. Hudson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 17-19.

The Knudsen cell was used to determine energy values from 800 to 950 C. A value of 66,440 cal. was found for $\Delta H°_{298}$ for α-Mn.

5867* On the Nature of Embrittlement Occurring While Tempering a Ni-Cr Alloy Steel. G. Bhat and J. F. Libsch. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 20-22.

Embrittlement at 925 F may be removed completely by reheating to higher temperatures for very short times and has no influence upon further embrittlement at 1250 F. Embrittlement at 1250 F appears related to a permanent structural change which has a significant retarding influence upon subsequent development of embrittlement at 925 F.

5868* Investigation of the Effects of Solutes on the Grain Boundary Stress Relaxation Phenomenon. S. Weinig and E. S. Machlin. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 32-41.

Studies on Cu binary alloys with Ni, Si, Al, and Ag comprising the range .03 to 1 at.% solute. Two stress relaxation peaks of grain boundary origin were ascertained.

5869* Embrittlement of Ti-Al Alloys in the 6 to 10 Pct Al Range. F. A. Crossley and W. F. Carew. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 43-46.

Embrittlement is attributed to the occurrence of a second phase. Degree of embrittlement appears to depend upon Al content, aging temperature and time, rate of deformation, and testing temperature.

5870* Creep of Single Crystals and Polycrystals of Aluminum, Lead, and Tin. C. D. Wiseman, O. D. Sherby, and J. E. Dorn. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 57-59.

Activation energies were determined by the technique involving the effect of abrupt changes in temperature on the creep rates. Single crystals and polycrystalline specimens have the same high temperature activation energies.

5871* Hydrogen Embrittlement in an Ultra-High-Strength 4340 Steel. E. P. Klier, B. B. Muvdi, and G. Sachs. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 106-112.

Hydrogen-embrittlement in the static tests depended on the strain rates used. Rate of recovery differed for cathodically cleaned and plated specimens. Failure in the sustained-load tests resulted from development of a surface crack.

5872* Tensile Deformation of Silver as a Function of Temperature, Strain Rate, and Grain Size. R. P. Carreker, Jr. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 112-115.

True stress and true strain data are reported for high purity Ag of three grain sizes over the temperature range 20 to 1173 K. Strain rate sensitivity was determined by rate-change tests.

5873* Effect of Orientation on the Plastic Deformation of Aluminum Single Crystals and Bicrystals. R. S. Davis, R. L. Fleischer, J. D. Livingston, and Bruce Chalmers. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 136-140.

Tensile stress-strain curves are reported.

5874* Low Temperature Properties of Steel Castings—Carbon Steels. G. M. Michie and W. J. Jackson. *Journal of Steel Castings Research*, no. 7, Jan. 1957, p. 9-11.

Effects of heat treatment on impact properties. The best low temperature impact properties are favored by maintaining a high Mn/C content ratio.

5875* (Russian.) Investigation of Impact Fatigue. **Issledovanie udarnoi ustalosti.** N. N. Davidenkov and E. I. Beliaeva. *Metallovedenie i Obrabotka Metallov*, no. 11, Nov. 1956, p. 4-10.

Fatigue limit of 10^5 cycles under static and dynamic conditions of alternating loads were determined for six kinds of alloyed steel in different thermal treatments.

5876* The Effect of Surface Finish on Fatigue. B. Cina. *Metallurgia*, v. 55, Jan. 1957, p. 11-19.

Emery polishing of a wide range of alloy-steel fatigue test pieces gives artificially high fatigue strength values due to the cold working of the test-piece surface. Truer fatigue strength values are obtained by electro-polishing the test pieces, which removes the cold worked layer.

5877* (English.) **Internal Friction and Critical Stress of Copper Alloys.** Shuichiro Takahashi. *Physical Society of Japan, Journal*, v. 11, Dec. 1956, p. 1253-1261.

Effects of strain amplitude on the internal friction and Young's modulus of polycrystalline specimens of Cu-Zn, Cu-Al, and Cu-P alloys with various concentrations of solute atoms.

5878 On the Mechanism of High-Temperature Creep in Metals With Special Reference to Polycrystalline Lead. P. Feltham. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1173-1188.

Expressions are derived for transient and equilibrium creep rates in terms of applied stress, temperature, grain size, and characteristics of the intergranular substructure.

5879 A Comparison of Magnetic Viscosity in Isotropic and Anisotropic High Coercivity Alloys. R. Street and J. C. Woolley. *Physical Society Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1189-1199.

Alcomax III specimens were made and the anisotropy was induced by cooling the material, from the single phase region, in a magnetic field of 4000 oersteds.

5880 Changes in Domain Structure Accompanying Reduction in Depth of a Single Crystal of Silicon Iron. L. F. Bates and A. Hart. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1200-1204.

Suggests the formation of a new structure with an energy comparable with that of the normal Néel type.

5881* (French.) Creep Properties at High Temperature of "Oneral M 47," a Refractory Cast Alloy. **Propriétés de fluage a haute température de l'onéral M 47, alliage réfractaire de fonderie.** R. Bibring and J. Poulignier. *Recherche Aéronautique*, no. 54, Nov.-Dec. 1956, p. 49-54.

Tests show that this Co-Cr-Mo-Ni alloy possesses good creep properties between 900 and 1000 C, and high temperature endurance, corrosion resistance, and structural stability.

5882 The Hydrogen Embrittlement of Iron and Steel. W. Rostoker. Paper from "Regional Technical Meetings". American Iron & Steel Institute, New York. p. 121-134. (TS300 Am35ta Vis.)

Mechanical deficiencies clearly attributable to H are reduced tensile ductility, flaking, and delayed fracture or static fatigue.

5883* (Spanish.) Optical Measurement of Plasticity. **Fotoplasticimetria.** Manuel Velasco de Pando. *Revista de Ciencia Aplicada*, v. 10, Sept.-Oct. 1956, p. 385-388.

Study of linear binomial law relating the phase delay with stress differences and principal deformations. A comparative theorem is suggested relating the plastic states of linear stress in various materials.

5884 Magneto-Resistance Effects in the Group I Metals at High Fields. R. G. Chambers. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 344-357.

Resistivity and Hall coefficient of pure specimens of Cu, Ag, and Au at 4 K.

5885* (English.) **Thermal Expansion Coefficient, Rigidity Modulus and Its Temperature Coefficient of the Alloys of Iron, Nickel, Cobalt and Chromium, and Relations of Super Invar to Stainless Invar and of Elinvar to Co-Elinvar.** Hakaru Masumoto, Hideo Saitô, Tatsuo Kôno, and Yutaka Sugai. *Science Reports of the Research Institutes, Tôhoku University*, v. 8, ser. A, Dec. 1956, p. 471-483.

Study of effect of Cr on expansion and rigidity.

5886*(English.) **Improvement of Copper Alloy Springs. I. Effect of Various Third Elements Added to Plain 60/40 Brass. II. 60/40 Brass Series Containing Iron, Manganese and Tin.** Osamu Izumi and Masayuki Kawasaki. *Science Reports of the Research Institutes, Tôhoku University*, v. 8, ser. A, Dec. 1956, p. 484-501.

5887* (English.) **Thermodynamic Activities in Iron-Cobalt Solid Solutions.** Tsuneo Satow, Sukeji Kachi, and Keizô Iwase. *Science Reports of the Research Institutes, Tôhoku University*, v. 8, ser. A, Dec. 1956, p. 502-510.

In the γ-phase temperature region, the entropy of mixing and the heat of mixing showed almost ideal behavior, and the activity obeyed Raoult's law; the α-phase is also studied.

5888 (German.) Effect of Subsequent Treatment on the Elastic Properties of Steel Wire. **Einfluss der Nachbehandlung auf die elastischen Eigenschaften von Stahldraht.** Wilhelm Püngel. *Stahl und Eisen*, v. 76, Dec. 13, 1956, p. 1685-1689.

Effect of straightening, heat treating, pre-stressing, and winding operations.

5889 Stress-Strain Relationship for Gray Iron. E. M. Stein. Paper from "Transactions of the American Foundrymen's Society". p. 214-216. (TS200 Am35t Vis.)

Medium- and low-strength gray irons are studied; stress-strain graphs are curved from the origin, showing that these irons do not have a true modulus of elasticity.

5890 Creep Behavior of Structural Joints of Aircraft Materials Under Constant Loads and Temperatures. Leonard Mordfin and Alvin C. Legate. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3842, Jan. 1957, 53 p. (TL570 Un3t)

Results of 55 creep and creep-rupture tests. Methods by which the time to rupture, mode of rupture, and deformation of joints in creep may be predicted.

5891* The Problem of Brittle Fracture. II. W. D. Biggs. *Welder*, v. 25, July-Sept. 1956, p. 48-55.

Assessment of transition temperature; metallurgical variables. (To be continued.)

5892 Brittle Fracture Propagation in Wide Steel Plates. W. J. Hall, R. J. Mosborg, and V. J. McDonald. *Welding Journal*, v. 36, Jan. 1957, p. 1S-8S.

Plates were tested under various conditions of stress and temperature with a brittle fracture initiated at an edge notch by a wedge subjected to impact. Specimens were isntrumented to provide a record of strain response and crack speed.

5893 Brittle Fracture Initiation Tests. C. Mylonas, D. C. Drucker, and L. Isberg. *Welding Journal*, v. 36, Jan. 1957, p. 9S-17S.

Exploratory tests were successful in producing many typically brittle fractures at loads corresponding to an average stress smaller than virgin yield.

5894 Notch Slow-Bend Testing of Zircaloy-2. R. G. Wheeler. *Welding Journal*, v. 36, Jan. 1957, p. 37S-40S.

Development and application of high-temperature bend-test equipment; effect of specimen, geometry, temperature, and cold work on fracture characteristics.

5895* (Russian.) Means of Determining the Melting Point of High-Melting-Point Metals and Alloys. **Sposob opredeleniia temperatury plavleniia tugoplavkikh metallov i splavov** V. P. Eliutin and V. F. Funke. *Zavodskaia Laboratoriia*, v. 22, Dec. 1956, p. 1444-1448.

Determinations by melting specimens with an electric current.

5896* (Russian.) A Method of Making Bending Fatigue Tests on Welded Structures. **Metodika ustalostnykh ispytanii svarnykh konstruktsii na izgib.** M. M. Kraichik, L. M. Shkol'nik, and B. A. Meisner. *Zavodskaia Laboratoriia*, v. 22, Dec. 1956, p. 1472-1479.

Shows that the character of the stress in bending tests can have an influence on the measured strength of welded I-beams.

See also: **4799** (fatigue in aircraft structures); **5672** (hardness testing methods); **5702** (wear resistance of steel); **5713** (mechanical properties on true stress and strain); **5842** (magnetic properties of permanent-magnet alloys); **5925** (ear formation in Al sheet); **5927** (embrittlement of Fe-Cr alloys); **5930** (effect of deformation on microstructure); **5940** (deformation of steel); **5976** (electrical conductivity and magnetic properties of Fe alloys); **6118** (rheology studies); **6273** (properties of stainless steel welds).

METALS—MECHANICAL WORKING

5897 Deep Boring. W. R. Petts. *Aircraft Production*, v. 19, Feb. 1957, p. 44-49.

Methods to adapt standard machine-tool equipment to deep-boring operations on high-tensile steels.

5898 Steel and Titanium Forgings. S. R. Carpenter. *Aircraft Production*, v. 19, Feb. 1957, p. 50-53.

A wide and intensive effort is necessary to produce forgings to closer tolerances, and so reduce high material losses and costs in machining.

5899 Machining Steel. *Aircraft Production*, v. 19, Feb. 1957, p. 78-81.

Development of new grades of tungsten-carbide for machining steels under present-day conditions of operation.

5900 Shock Forming With Explosives. E. J. Tangerman. *American Machinist*, v. 101, Jan. 14, 1957, p. 110-111.

Gunpowder and stronger explosives show real promise in punching, upsetting, forming, expanding, swagging, cupping, bulging, and otherwise working high-tensile stainless steels and Ti alloys.

5901 Explosives Fabricate Metal At Lockheed. Glen N. Rardin. *American Machinist*, v. 101, Jan. 14, 1957, p. 112-115.

Explores the realm of sudden application of high pressures on the behavior of metal fabrications. Work shows that as the metal being formed absorbs the energy of the explosion, work-hardening characteristics are changed and grain structure may be altered, and that each alloy has its own critical velocity. Application of both low- and high-explosives are being studied in three phases: punching holes in metal sheet resistant to conventional drilling with a modified stud driver operating with a .22-caliber shell as a captive-piston gun with a velocity of 800 ft. per sec.; low-explosive pressure forming from the interior of tubes at about 50,000 psi. with 8-gage shotgun shells; and high-explosive pressure forming of simple cups to investigate elongation, work hardening, and the effect of shock-wave impact upon structure of the metal with detonating fuse (PETN) and electric caps. Problems and further applications are discussed. Suggests further experimental work might involve use of hollow-charge explosives.

5902 Fabrication of Molybdenum Sheet. John R. Van Orsdel and Roland B. Fischer. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1151, Dec. 1956, 10 p. (UF767 Un3b Contin.)

Careful rolling and heat-treating procedures will produce sheet capable of 90° bends, transverse to the rolling direction, at room temperature, with no evidence of fibering.

5903* (Russian.) On the Mechanism of the Action of Lubricants in Metal Pressing. **O mekhanizme deistviia smazok pri obrabotke metallov davleniem.** S. Ia. Veiler, V. I. Likhtman, and P. A. Rebinder. *Doklady Akademii Nauk SSSR*, v. 110, Oct. 21, 1956, p. 985-988 + 1 plate.

Shows that in metal forming the lubricant has an active influence on surface deformation and the elastic phenomena appearing after pressure relief, and that lubrication improves the quality of the surface under treatment.

5904* (Czech.) Forging High Speed Steels. **Kováni rychlořezných oceli.** Rudolf Suchopárek. *Hutník*, v. 6, Oct. 1956, p. 304-308.

The handling and working of high speed steel from the ingot to the finished forging. Defects that could result from improper working and how to avoid them. Ways of reclaiming defective pieces.

5905 New Development in Impact Extrusion Field Extends Process Control. Marvin M. Goldstein. *Industrial Heating*, v. 24, Jan. 1957, p. 75-76, 82.

New machine produces slugs cast directly from molten metal. The slugs are formed to exact size required for extrusion and thus scrap loss is eliminated.

5906 Stamping: What Type Dies to Use. Federico Strasser. *Iron Age*, v. 179, Feb. 7, 1957, p. 99-101.

Three die types are compared for labor costs, tooling costs, the accuracy possible, and production rate.

5907 Wide Flange Beam Rolling at Inland Steel Co. W. E. Dittrich. *Iron and Steel Engineer*, v. 34, Jan. 1957, p. 67-75.

Rolling scheme requires interchanging housings to permit alternate rolling of wide flange and conventional sections. Rolling rates of 778 tons per turn on 10 X 5.75 in. sections have been attained.

5908* (English.) **A New Method of Electro-Machining of Hard Metals.** Tasaburô Yamaguti. *Japan Academy, Proceedings*, v. 32, Oct. 1956, p. 579-584.

Method and apparatus are described.

5909* Symposium on Titanium. II. Mill and Fabrication Economics. S. A. Gordon. *Journal of Metals*, v. 9, Jan. 1957, p. 167-172.

Aluminum and Ti are compared as materials for aircraft fabrication. Recent accumulation of knowledge concerning Ti should reduce the cost problem.

5910* Effect of Rolling Procedure on the Kinetics of Recrystallization of Cold-Rolled Copper. J. T. Michalak and W. R. Hibbard, Jr. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 101-106.

Materials rolled by the straight-pass, cross-pass, and compression-pass techniques developed different deformation and recrystallization textures, different 1-hr. recrystallization temperatures, and different recrystallization kinetics, although they had the same temperature dependence of the rate of recrystallization.

5911* Grinding Temperatures. J. E. Mayer, Jr. and M. C. Shaw. *Lubrication Engineering*, v. 13, Jan. 1957, p. 21-27.

Apparatus for measuring the temperature of a freshly ground surface by means of a photoconducting PbS cell and an oscilloscope is applied to a study of the influence of different grinding fluids.

5912* Improving Cutting Tool Performance by Practical Research. *Machinery (London)*, v. 90, Jan. 18, 1957, p. 135-142.

Particular reference is made to drilling with examples of the research results obtained.

5913* Contour Etching. A. W. Shepperd. *Machinery (London)*, v. 90, Jan. 18, 1957, p. 153-159.

Depths of more than one in. can be attained by the process.

5914 Glass Baths for Heating Steel Extrusion Billets. Osvaldo Balestra. *Metal Progress*, v. 71, Jan. 1957, p. 109-112.

Considerable savings in fuel and maintenance cost have been realized by using a gas-fired molten glass bath instead of a salt bath for preheating steel extrusion billets.

5915* Sawing Radio-Active Metals by the Arc-Process. Frank Bevilacqua. *Metalworking Production*, v. 101, Jan. 4, 1957, p. 11-13.

Rotating disc cuts a variety of radioactive metals by using electrical discharge or arc machining process and remote control. A special unit simplifies decontamination problems.

5916* Application of Electro-Erosion to Metal Working. H. Opitz. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 203-208.

Spark-discharge machines and their applications.

5917* Contribution to a Solution of the Problem of Short Duration Tests for Determining the Life of Turning Tools. E. Bickel. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 209-214.

Derivation of curves for predicting tool life using data acquired in tests requiring only 10 to 25 min.

5918* Distribution of Temperature in a Cylindrical Grinding Machine, From Starting to Steady State. G. Pahlitzsch. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 215-218.

5919* Vibrations Caused by Chip Formation. P. Landberg. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 219-228.

Chip vibrations can be suppressed by diminishing the feed perpendicular to the cutting edge, either by diminishing the feed itself or by using a smaller cutting angle.

5920* Cost-Cutting With Grinding Wheels. I. Snagging Wheel Speed Control. John A. Mueller. *Modern Castings*, v. 31, Feb. 1957, p. 62-64.

Control of surface speed is first step in planning snagging operations that will remove metal, faster, at lower cost.

5921 Research Into Some Metal-Forming and Shaping Operations. W. Johnson. *Sheet Metal Industries*, v. 34, Jan. 1957, p. 41-50.

Experimental and theoretical investigations on the drawing and redrawing of cylindrical shells. (To be concluded.)

5922* Buckling Limits in Contour Forming. I. William W. Wood. *Tool Engineer*, v. 38, Feb. 1957, p. 85-91.

Interpretation of failure; plate buckling equation; formability indexes of aircraft materials.

5923* New Techniques in Coated Abrasive Machining Methods. Hugh N. Dyer. *Tooling and Production*, v. 22, Jan. 1957, p. 63-68.

Variables affecting the belt grinding process and their control. Includes backing support, abrasives, and grinding fluids.

5924* (Russian.) A New Method of Surface Hardening Machine Parts. **Novyi metod poverkhnostnogo uprochneniia detalei mashin.** A. A. Vorob'ev. *Vestnik Mashinostroeniia*, v. 36, Dec. 1956, p. 69-70.

Surface hardening of round machine parts by a hammering method.

5925* (German.) Texture and Ear Formation of Pure Aluminum Sheets From Continuous Cast and Molded Ingots. **Textur und Zipfelbildung an Reinaluminiumblechen aus Strang- und Kokillenguss.** Frank Haessner, Georg Masing, and Hein Peter Stüwe. *Zeitschrift für Metallkunde*, v. 47, Dec. 1956, p. 743-750.

The different recrystallization behavior of continuously and intermittently cast metal was found to be caused by different content of precipitates.

See also: **5318** (numerical control of machine tools); **5320** (automated engine plant); **5333** (computers in metalworking); **5862** (rolling of Hf); **6170** (machining plastics).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

5926* (English.) **X-Ray and Magnetic Study of Nickel Selenides in the Range NiSe to $NiSe_2$.** Fredrik Grønvold and Einar Jacobsen. *Acta Chemica Scandinavica*, v. 10, no. 9, 1956, p. 1440-1454.

The NiSe phase has a broad range of homogeneity extending from $NiSe_{1.02}$ to $NiSe_{1.30}$. Its structure is of a NiAs-like type up to the composition $NiSe_{1.20}$.

5927* (German.) Change of State Which Provokes 475°C Embrittlement of Iron-Chromium Alloys. **Überlegungen über die Zustandsänderung, die zur 475°-Versprödung der Eisen-Chrom-Legierungen führt.** Werner Köster and Albrecht von Kienlin. *Archiv für das Eisenhüttenwesen*, v. 27, Dec. 1956, p. 793-799.

Measurements to determine the mechanism of embrittlement.

5928* (German.) Damping of Mechanical Oscillation During Martensite Formation in Iron-Nickel Alloys. **Die Dämpfung mechanischer Schwingungen während der Martensitbildung in Eisen - Nickel - Legierungen.** Erich Scheil and Johannes Müller. *Archiv für das Eisenhüttenwesen*, v. 27, Dec. 1956, p. 801-805.

Kinetic peculiarities of α-γ-transformation in Fe-Ni alloys. Determination of damping properties and electrical resistance of Fe-Ni alloys with 10, 15, and 20% Ni content.

5929 A Critical Review of the Mechanism of Ageing in Alloys Based on the Aluminium-Zinc-Magnesium System. I. J. Polmear. *Commonwealth of Australia, Dept. of Supply, Aeronautical Research Consultative Committee, Report* ACA-59, Aug. 1955, 22 p. (TL529 Au78.1r Vis.)

A survey of available literature pertaining to structural and property changes accompanying precipitation.

5930* (French.) Photomicroscopic Examination of Metals Subjected to a Mechanical Strain. **Examen au microscope à photoémission de métaux soumis à une contrainte mécanique.** Robert Goutte, Clément Guillaud, and Robert Arnal. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2026-2028.

Photomicrography of the structure and substructure of sheets of Au, Ag, and Pd, cleaned by ion bombardment and subjected to various mechanical strains.

5931* (French.) Electron Diffraction Study of the Formation of Thin Layers of Aluminum-Antimony Alloys. **Étude par diffraction électronique de la formation des alliages aluminium-antimoine en couches minces.** Pierre Michel. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2063-2065.

Study of the structure of thin layers of Al-Sb produced by simultaneously or successively vaporizing the pure metals. An unstable phase of the diamond type was observed.

5932* (French.) A New Method for the Rapid Electrolytic Polishing of Surfaces and Its Metallographic Applications. **Nouvelle méthode pour le polissage électrolytique rapide des surfaces et ses applications métallographiques.** Pierre A. Jacquet. *Comptes Rendus*, v. 243, Dec. 17, 1956, p. 2068-2071.

Partial or complete polishing of metals and alloys was obtained by means of a simple device with a cathode surrounded with spongy insulating cloths.

5933* (Russian.) Investigation of Metallic Compounds in Nickel Alloys Containing Aluminum. **Issledovanie metallicheskikh soedinenii v nikelevykh splavakh soderzhashchikh aliuminii.** R. B. Golubtsova and L. A. Mashkovich. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 1, 1956, p. 824-826.

Microchemical analysis of some alloys of various Al contents, including Ni-Al, Ni-Cr-Al, and Ni-Cr-Al-Ti. A phase Ni_3Al was found.

5934* (Italian.) Theoretical Study of the Structure of Graphite in Spheroidal Cast Iron. **Studio teorico sulla struttura della grafite nella ghisa sferoidale.** Rinaldo Cattaneo. *Fonderia*, v. 5, Dec. 1956, p. 621-624.

A study of graphite in the light of modern chemical concepts. The special properties of the iron are connected with the typical arrangement of graphite in the metallic matrix.

5935 The Effect of Cooling Rate on the Nucleation and Growth of Beta-Uranium Hydride in Metallic Uranium. H. R. Gardner and J. W. Riches. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-43428, Oct. 1956, 28 p. (UF767 Un3.1hw Contin.)

For cooling rates ranging from 0.002 to 300 C per sec., uranium hydride nucleated primarily at grain boundaries either as discrete particles or in conjunction with carbide-type inclusions. Size of hydride precipitates increased, and the number decreased, with decreasing cooling rate.

5936* The Uses of Diamond Abrasives in Metallographic Polishing. L. E. Samuels. *Industrial Diamond Review*, v. 16, Dec. 1956, p. 233-237.

Relief between constituents and preservation of edges; retention of non-metallic inclusions and constituents; polishing special materials.

5937 The Equilibrium Diagram of the System Copper-Germanium. J. Reynolds and W. Hume-Rothery. *Institute of Metals, Journal*, v. 85, Dec. 1956, p. 119-127 + 1 plate.

5938 Identification of Inclusions. A Study of Deoxidation Products in Iron-Oxygen Melts. F. B. Pickering. *Iron & Steel*, v. 30, Jan. 1957, p. 3-9.

Optical and chemical properties of the inclusions occurring in Fe-O alloys deoxidized with Mn, Al, Si, and Ti.

5939 The Formation of Carbides in Low-Carbon, Chromium-Vanadium Steels at 700°C. S. W. K. Shaw and A. G. Quarrell. *Iron and Steel Institute, Journal*, v. 185, Jan. 1957, p. 10-22.

Structures and compositions of the carbides occurring at 700 C in 100 low-carbon steels containing up to 12% Cr and up to 2% V were examined by X-ray and chemical analysis. The carbides were extracted electrolytically using a 5% aqueous solution of HCl and a current density of .025 amp. per sq. cm. An equilibrium diagram was constructed based on heat treatments of 500 to 2000 hrs. The results show that even after several hundred hrs. at 700 C, changes of carbide structure as well as of composition may occur. The extraction technique sometimes gives misleading results if a change in carbide type occurs at a late stage in the tempering.

5940 Investigation of the Behaviour of Metals Under Deformation at High Temperatures. III. The Deformation, Microstructure, and Form of Carbides in a 0.15% C, 0.5% Mo Steel in Creep Tests. C. H. M. Jenkins and E. A. Jenkinson. *Iron and Steel Institute, Journal*, v. 185, Jan. 1957, p. 23-46.

Vacuum tests in the temperature range 450 to 850 C for times ranging from a few min. to 13,470 hr. were used to trace the extent of transcrystalline and intercrystalline cracking. The limits are shown in stress/temperature and time/temperature diagrams.

5941* (Russian.) Effect of Alloy Structure on the Diffusion Process. **Vliianie struktury splavov na protsess diffuzii.** L. M. Mirskii. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, no. 11, Nov. 1956, p. 40-51 + 2 plates.

Mechanism of the mobility of the atom in a crystalline lattice. A method is described showing the qualitative and quantitative link existing between the mechanism of the process and the parameters of diffusion in a Ni-W system.

5942* (Russian.) Cathodic Sputtering on a Metal Surface. **O protsessakh na poverkhnosti metalla pri katodnom raspylenii.** G. V. Spivak, V. E. Iurasova, I. N. Prilezhaeva, and E. K. Pravdina. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 20, Oct. 1956, p. 1184-1189 + 2 plates.

Principles and practice of using the sputtering process as a means of etching metal surfaces for structure studies. Advantages over the chemical method.

5943* (English.) **Recent Progress in the Study of the Structure of Martensite and Its Decomposition Products in Carbon Steels.** Kehsin Kuo. *Jernkontorets Annaler*, v. 140, no. 11, 1956, p. 854-904.

This review of 123 references is written so that in most cases no search in the original Russian literature is needed. Emphasizes X-ray diffraction methods in the study of phase transformations.

5944 Study of Atomic Structure of Metal Surfaces in the Field Ion Microscope. Erwin W. Müller. *Journal of Applied Physics*, v. 28, Jan. 1957, p. 1-6.

The hopping height of the rebounding gas atom, which depends on the atom's polarizability, the tip temperature, tip radius, and field, is significant for the resolution. Photographs of W and Re surfaces with the atomic lattice resolved and in different states of disorder are presented.

5945 Self-Diffusion of Silver in Silver-Palladium Alloys. N. H. Nachtrieb, J. Petit, and J. Wehrenberg. *Journal of Chemical Physics*, v. 26, Jan. 1957, p. 106-109.

Studied in alloys containing 0.00, 1.49, 3.69, 9.87, and 21.84 at.% Pd at four temperatures.

5946* Solubility of Boron in Fe_3C and Variation of Saturation Magnetization, Curie Temperature, and Lattice Parameter of $Fe_3(C,B)$ With Composition. M. E. Nicholson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 1-6.

At 1000 C, 80% of the C in Fe_3C could be replaced by B.

5947* Aluminum-Magnesium Equilibrium Diagram. J. B. Clark and F. N. Rhines. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 6-7.

5948* Uranium-Silicon Alloys. A. Kaufmann, B. Cullity, and G. Bitsianes. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 23-27.

Phase diagram; microstructure; properties of the ϵ phases.

5949* Structure of the Transition Phase Omega in Ti-Cr Alloys. A. E. Austin and J. R. Doig. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 27-30.

These alloys harden after β-quenching by formation of an ω-phase. The hardness appears to be caused by strain in the β-matrix produced by concurrent enrichment of alloy content in the ω-phase.

5950* Twinning in Indium Antimonide. Peter Haasen. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 30-32.

5951* X-Ray Satellite Line Structure of Ferrite for CrK Radiation. V. Weiss and E. P. Klier. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 41-43.

5952* Solid Solubility of Carbon in Chromium. W. H. Smith. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 47-49.

5953* Uranium-Zinc System. P. Chiotti, H. H. Klepfer, and K. J. Gill. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 51-57.

The phase fields existing in the U-Zn system at 1 and 5 atm. pressure were determined from X-ray, metallographic, thermal, and vapor pressure data. Only one compound, UZn_9 is formed in this system.

5954* Magnetic Method for the Measurement of Precipitate Particle Sizes in a Cu-Co Alloy. J. J. Becker. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 59-63.

Extremely small ferromagnetic precipitate particles in a nonmagnetic matrix behave like a paramagnetic substance of very large moment. Magnetization curves of such substances can be used to determine precipitate particle sizes and size distributions. The Co particles are shown not to be hexagonal, but spherical or plate-shaped.

5955* Control of Strain Aging in Alpha-Iron. Eric R. Morgan and J. C. Shyne. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 65-69.

Practical control of strain aging must come through control of the effective amounts of C and N in solution. Tests with alloys containing C and N show that only C strain aging can be Eliminated by heat treatment. Use of Ti, Al, V, and B as alloying elements for the control of N strain aging is examined.

5956* Sigma-Phase in Certain Ternary Systems With Vanadium. Joseph B. Darby, Jr. and Paul A. Beck. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 69-72.

Six ternary systems with V were investigated by microscopic and X-ray methods for the boundaries of the σ-phase. In all cases, the σ-phase formed a relatively narrow elongated field in the ternary system, connecting with the binary σ-phases.

5957* Constitution of Nickel-Rich Quinary Alloys in the System Ni-Fe-Cr-Ti-Al. A. Taylor. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 72-75.

5958* Simple Orientation Relationships for Secondary Recrystallization in Si-Fe. C. G. Dunn and P. K. Koh. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 81-86.

A fairly general 25 to 30° (110) rotation relationship was found between components in the secondary recrystallization texture and the cold rolled orientation.

5959* Nucleation of Voids in Metals During Diffusion and Creep. R. Resnick and L. Seigle. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 87-94.

Evidence that voids formed during diffusion in brass are heterogeneously nucleated. The nuclei appear to be oxide particles, probably ZnO. When these are removed by remelting, practically no voids form upon subsequent dezincification.

5960* Studies on Diffusion in Molten Metals. Kichizo Niwa, Mitsuo Shimoji, Satoshi Kado, Yoshihiko Watanabe, and Toshio Yokokawa. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 96-101.

Diffusion coefficients were measured for Sn-Pb, Bi-Pb, Sb-Pb, Cd-Pb, Sn-Bi, and Sb-Sn from 450 to 600 C. Relations between diffusion coefficients and atomic fractions obey the thermodynamic formulas of irreversible processes.

5961* Uranium-Bismuth System. R. J. Teitel. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 131-136.

Phase diagram; solubility and crystallographic data. Three intermetallic compounds were found; UBi_2, U_3Bi_4, and UBi.

5962* On the Kinetics of the Pearlite Reaction. John W. Cahn. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 140-144.

Existing kinetic data are reevaluated in terms of recently derived rate laws. It is found that the nucleation rate varies more rapidly with temperature than previously supposed.

5963 Phase-Diagram Study of Alloys in the Iron-Chromium-Molybdenum-Nickel System. C. J. Bechtoldt and H. C. Vacher. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 7-19.

Alloys were examined after quenching from 2,200, 2,000, 1,800, 1,650, and 1,500 F. Compositional limits of stability of seven phases are summarized in diagrams.

5964* (Russian.) Mechanism of Austenite Transformation in Iron-Carbon Alloys. **O mekhanizme prevrashcheniia austenita v zhelezouglerodistykh splavakh.** A. N. Alfimov. *Metallovedenie i Obrabotka Metallov*, no. 11, Nov. 1956, p. 23-25.

A study of stresses exerted on atomic layers in a lattice model of austenite and martensite in connection with shear deformation under various temperature conditions.

5965* (Russian.) Isothermal Transformation of Austenite in High Speed Steel. **Izotermicheskoe prevrashchenie austenita bystrorezhushchei stali.** A. P. Guliaev and K. A. Malinina. *Metallovedenie i Obrabotka Metallov*, no. 12, Dec. 1956, p. 2-8.

Decomposition of austenite in R9 steel. Results are applied to other high speed steels to determine optimum heat treatment conditions.

5966 (Italian.) Researches on Crystal Orientation in Cold Rolled Recrystallized Iron Sheets, With Regard to Iron Carbonyl. **Ricerche sull'orientamento cristallino in lamiere di ferro laminate a freddo e ricristallizzate, con riguardo al ferro carbonile.** H. Weik. *Metallurgia Italiana*, v. 48, Nov. 1956, p. 494-502.

Describes the preparatory treatment given to samples, and then compares the crystal orientation at various stages of processing. Discusses methods for the elimination of undesirable orientations.

5967 Grain Growth in Steels. I. Role of Aluminium Nitride. A. B. Chatterjea and B. R. Nijhawan. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 3-6.

After a brief survey of existing information on the grain growth in metals and alloys, different views on grain-growth inhibition in steels are critically examined. (To be continued.)

5968 Development of Metallurgical Microscopy. J. C. Wright. *Metal Treatment and Drop Forging*, v. 24, Jan. 1957, p. 15-20.

History of development of normal light microscopes and special instruments such as phase-contact, polarized light, X-ray, and electron microscopes. Closely-linked techniques of metallographic polishing, etching, and photographing are also considered.

5969* (French.) Etching Agents for Steels in Electron Microscope Studies. **Réactifs d'attaque des aciers pour microscopie électronique.** Isamu Eguchi and Chiaki Asada. *Metaux, Corrosion-Industries*, v. 31, Dec. 1956, p. 483-487.

Etchants recommended showed entirely different structures, with the electron microscope, of the ferrite matrix in normalized carbon steel. Reagents should be carefully chosen. Suggestions for improved etchants.

5970 Diffusion in Ordered and Disordered Copper-Zinc. A. B. Kuper, D. Lazarus, J. R. Manning, and C. T. Tomizuka. *Physical Review*, v. 104, ser. 2, Dec. 15, 1956, p. 1536-1541.

The diffusivities of Cu^{64}, Zn^{65}, and Sb^{124} in single crystals of 47 to 48 at.% Zn Cu-Zn were measured over the temperature range 265-817 C using sectioning techniques.

5971 Lattice Constants and Brillouin Zone Overlap in Dilute Magnesium Alloys. F. W. von Batchelder and R. F. Raeuchle. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 59-61.

Data on primary solid solutions of In, Al, and Cd in Mg.

5972 Magnetic Structures in Copper-Manganese Alloys. David Meneghetti and S. S. Sidhu. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 130-135.

5973 "Lozenge" and "Tadpole" Domain Structures on Silicon-Iron Crystals. L. F. Bates and P. F. Davis. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1109-1111 + 2 plates.

5974 Continuous Distributions of Dislocations: Surface Dislocations and the Crystallography of Martensitic Transformations. R. Bullough and B. A. Bilby. *Physical Society, Proceedings*, v. 69, no. 444B, Dec. 1956, p. 1276-1286.

Using several assumptions, Burgers theory is applied to deduce the habit plane, shape deformation, and orientation relationship.

5975* (Swedish.) Crystallography and Metallography of Uranium. **Uranets kristallografi och metallografi.** Roland Kiessling. *Svensk Kemisk Tidskrift*, v. 68, no. 11, 1956, p. 581-587.

Historical background; electron structure according to Bohr and Seaborg. Crystallographic aspects of the metals of the actinide group. Physical properties of U and its alloys.

5976 The Use of Electrical and Magnetic Properties in the Study of High-Purity Iron Alloys. Frank E. Jaumot, Jr. and Raymond L. Smith. Paper from "Regional Technical Meetings". American Iron & Steel Institute, New York. p. 211-230. (TS300 Am35ta Vis.)

Important electrical and magnetic properties; their value in studying phase changes and precipitating systems.

5977* (Polish.) Etching Steel in Solutions. **Wytrawianie stali w roztworach.** Zygmunt Wusatowski. *Wiadomości Hutnicze*, v. 12, Nov. 1956, p. 332-335.

Theory and practice of etching carbon-, stainless-, and acid-resistant steels.

5978* (German.) Copper-Silver-Cadmium(II) System. **Das System Kupfer-Silber-Kadmium II.** Erich Gebhardt and Günter Petzow. *Zeitschrift für Metallkunde*, v. 47, Dec. 1956, p. 751-759.

Temperature composition sections with constant Ag and Cu concentrations of 5% of each and isothermal sections at 600, 500, and 300 C.

See also: **5447** (diffusion and acceptor behavior of Cu); **5842** (structure of permanent-magnet alloys); **5844** (transformations in Fe-Cr alloys); **5862** (rolling texture of Hf); **5910** (recrystallization in Cu); **5982** (metallography of Al powder extrusions); **6118** (rheology studies).

METALS—POWDER

5979* (French.) Preparation of Copper Powder. **Préparation du cuivre à l'état divisé.** P. Trambouze. *Bulletin de la Société Chimique de France*, nos. 11-12, Nov.-Dec. 1956, p. 1752-1756.

More finely divided Cu was obtained when an inert substance having a high calorific conductivity was mixed with various oxides before reducing them with H at 150 C. A simple interpretation is suggested.

5980* Design Limits Set by Tooling for Powder Metal Parts. George G. Karian. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 110-115.

Die design factors for pressing compacts of various degrees of complexity.

5981* Rate of Capillary Rise of Liquid Metal in a Higher Melting Metal Powder Compact. K. A. Semlak, C. W. Spencer, and F. N. Rhines. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 63-64.

5982* Metallography of Aluminum Powder Extrusions. F. V. Lenel, G. S. Ansell, and E. C. Nelson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 117-124.

Carbon-film replicas prepared for electron microscopy show microstructural details. Differences between commercial and experimental extrusions are accounted for on the basis of spheroidization of Al oxide plates.

5983* Properties of Aluminum Powders and of Extrusions Produced From Them. F. V. Lenel, A. B. Backensto, Jr., and M. V. Rose. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 124-130.

Tensile strength and yield strength are functions of the powder particle size or flake powder thickness. Degree of dispersion of the oxide appears to be the controlling factor in the strengthening mechanism of these extrusions.

5984 Powder Metallurgy. VI. J. F. C. Morden. *Metal Industry*, v. 90, Jan. 11, 1957, p. 23-25.

Covers compacting by hot pressing, rolling, and extrusion.

5985* (German.) Process Phenomena During Sintering of Metals. **Die Vorgänge bei der Sinterung metallischer Werkstoffe.** R. Palme. *Metall*, v. 11, Jan. 1957, p. 8-9.

Fundamental processes during sintering of single phase metal powder, especially with respect to the effect of temperature.

5986 (English, French, and German.) **Plansee Proceedings 1955. Sintered High-Temperature and Corrosion-Resistant Materials.** F. Benesovsky, editor. 472 p. 1956. Pergamon Press, Ltd., London. (TN695 P69p)

Consists of 38 papers covering metallic hard carbides, borides, silicides, refractory transition metals, and combinations of metallic and non-metallic components.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

5987 Statistical Quality Control in a Petroleum Control Laboratory. J. M. Duncan. *ASTM Bulletin*, no. 219, Jan. 1957, p. 40-43.

A program designed to keep laboratory management informed of the degree of control and precision of a test and to tell when corrective action is needed with a minimum expenditure of manpower.

5988 The Depth of Diffused Layers. W. L. Bond. *Bell Laboratories Record*, v. 35, Jan. 1957, p. 1-5.

A technique of using interference fringe patterns was devised to measure the depth of some of the thinnest of diffused layers within about one millionth of an inch.

5989* Non-Destructive Testing. A. E. Cawkell. *Ceramics*, v. 9, Jan. 1957, p. 12, 14-15.

Equipment, techniques, and applications of electrodynamic and ultrasonic methods for testing ceramics.

5990 Spot Tests for Copper Alloys. W. Stöckli. *Metal Industry*, v. 90, Jan. 11, 1957, p. 31-32.

Identification procedures for use with electrolytic tests.

5991* (Polish.) Magnetic Defect Detection. **Defektoskopia magnetyczna.** Tadeusz Frąckiewicz. *Wiadomości Hutnicze*, v. 12, Nov. 1956, p. 335-340.

Principles and methods of testing steel articles by magnetic means. Areas of application; "wet" powder and "dry" powder methods; instruments used for tests; evaluating results.

5992 Ultrasonic Inspection Moves to the Field. Dwight J. Evans. *World Oil*, v. 144, Feb. 1957, p. 128-132.

High frequency sound waves are being used successfully and economically for the location and evaluation of defects in oil field equipment.

See also: **5667** (thickness measurement of thin carbon films).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

5993 Corrosion and Other Aspects Relative to the Use of Diphenyl as a Coolant-Moderator. Gustave C. Milak. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5587, Nov. 1956, 43 p. (UF767 Un3.1an Contin.)

5994* (Russian.) Splitting the Nucleus. **Delenie iader.** D. Uiler. *Atomnaia Energiia*, no. 5, 1956, p. 71-79.

A short study of nuclear fission. Effects of the separate canals and fluctuations in the fissional areas and asymmetry. Importance of barrier height in the two fission types. Application of the static theory and its difficulties.

5995* (Russian.) Calorimetric Measurements of Compounds of the Natural Radioactive Families. **Kalorimetricheskie izmereniia preparatov estestvenno-radioaktivnykh semeistv.** G. V. Gorshkov and N. S. Shimanskaia. *Atomnaia Energiia*, no. 5, 1956, p. 86-93.

Evaluation of half-life of Ra and the γ-radiation energy of Ra and Ac.

5996 The Determination of Linear Distortion in Nuclear Emulsions. A. J. Apostolakis and J. V. Major. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 9-11.

Ratio of linear distortion vector to curvature distortion vector is 2.03 ± 0.03 within the temperature range of 15 to 24 C. The vectors are in opposite directions.

5997 Half-Life Determination of Some Radionuclides. W. F. Merritt, P. J. Campion, and R. C. Hawkings. *Canadian Journal of Physics*, v. 35, Jan. 1957, p. 16-20.

Measurements on Na-22, Ru-106, Cc-134, Ce-144, Pm-147, and Tl-204.

5998* (Russian.) Full Cross-Sections for the Interaction of 650 Mev Energy Protons With Nuclei. **Polnye secheniia vsaimodeistviia protonov s energiei 650 mev s iadrami.** V. I. Moskalev and B. V. Gavrilovskii. *Doklady Akademii Nauk SSSR*, v. 110, Oct. 21, 1956, p. 972-974.

Results obtained in measurements of the interaction of 650 m.e.v. energy protons with nuclei of Be, C, O, Al, Cu, Sn, Pb, and U.

5999* (Russian.) Evaluation of the Upper Boundary of the Cross Section for the Radiation Capture of Resonance Energy (275 k.e.v.) Neutrons by the Li^7 Isotope. **Otsenka verkhnei granitsy secheniia radiatsionnogo zakhvata neitronov resonansnoi energiei (275 kev) izotopom Li^7.** E. A. Koltypin and V. M. Morozov. *Doklady Akademii Nauk SSSR*, v. 111, Nov. 11, 1956, p. 331-333.

6000* (Russian.) Polarization of Low Energy Protons in Scattering on Carbon. **Poliarizatsiia protonov maloi energii pri rasseianii na uglerode.** B. V. Gavrilovskii, V. Ia. Golovnia, K. V. Karadzhev, A. P. Kliucharev, and V. I. Man'ko. *Doklady Akademii Nauk SSSR*, v. 111, Nov.-Dec. 1956, p. 59-62.

Study of proton polarization during elastic scattering on C^{12} using an electrostatic generator. Experimental data conform to theoretical calculations.

6001 A Directional Ion Chamber Instrument for Measuring High-Level Gamma Activities. James S. Stutheit. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-176, Sept. 1956, 11 p. (UF767 Un3.1dp Contin.)

Remotely operated instrument used to measure γ fields of 1 to 10,000 r. per hr. utilizes an air ion chamber and a battery-operated logarithmic millimicroammeter.

6002 A Beta-Gamma Monitor for Liquid Streams. Edward C. Wingfield. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-177, Sept. 1956, 12 p. (UF767 Un3.1dp Contin.)

A hollow, rotating cylinder of liquid surrounds, but does not touch, a plastic scintillator. Scintillations are viewed by a photomultiplier tube and are indicated by a count rate meter.

6003* **The Sodium Graphite Reactor Electric Power Plant.** Sidney Siegel. *Electrical Engineering*, v. 76, Jan. 1957, p. 60-64.

Principles, features, and safety considerations.

6004* (English and German.) Encyclopedia of Physics. **Handbuch der Physik. v. XXXV. Pt. I.** Atoms. **Atome.** S. Flügge, editor. 454 p. 1957. Springer-Verlag, Berlin. (Q21 G27h3)

The fundamental constants of atomic physics. Quantum mechanics of one- and two-electron systems.

6005 (French.) Thorium and the Fissionable Elements. **Le thorium et les éléments fissiles.** R. Gibrat. *Énergie Nucléaire, Suppl. to Chimie et Industrie*, v. 76, Oct. 1956, p. 25-31.

Studies of U-233, U-235, and Pu-239. Compares their properties and surveys problems in the chemical treatment of irradiated Th to separate U-233.

6006 (French.) The Scintillation Counter, Principle and Applications. **Le compteur à scintillation. Principe et applications.** Michel Langevin. *Énergie Nucléaire, Suppl. to Chimie et Industrie*, v. 76, Oct. 1956, p. 46-51.

6007 Feasible Chemical Forms for Thorium Breeder Blanket. M. H. Lietzke and R. W. Stoughton. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 202-207.

Aluminum-jacketed metal slugs require elaborate processing and refabrication. Of the other blanket forms, thorium oxide and nitrate in deuterium oxide appear most promising.

6008 Proceedings of the Fifth Scintillation Counter Symposium. *Institute of Radio Engineers, Transactions on Nuclear Science*, v. NS-3, Nov. 1956, 144 p. (TK1 In6.6ns Contin.)

A compilation of 27 papers covering various types of equipment and techniques.

6009* **The Standardization of Electron-Capture Isotopes.** R. A. Allen. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 289-298.

Method consists of measuring the efficiency of a 4π proportional counter for the characteristic *K*-X-rays by constructing a curve relating *K*-X-ray count rate and the inverse of the pressure of the counting gas.

6010* **Production of Mg^{28} in the Pile and Cyclotron at Harwell.** C. E. Mellish and G. W. Crockford. *International Journal of Applied Radiation and Isotopes*, v. 1, Jan. 1957, p. 299-304.

Two methods of production of Mg^{28} are investigated. By bombardment in the reactor the t,p, reaction on Mg in an alloy of Li and Mg is used and the dependence of the cross-section on the Li content is determined. In the cyclotron method the spallation of Cl by proton bombardment is examined and the dependence on proton energy and target size is measured.

6011 Introduction to Atomic Physics. S. Tolansky. 4th Ed. 435 p. 1956. Longmans, Green and Co., New York. (QC173 T57i)

A largely historical treatise illustrating the development of modern physics from the classical standpoint.

6012 Inelastic Cross-Sections for Fission-Spectrum Neutrons. III. H. A. Bethe, J. R. Beyster, and R. E. Carter. *Journal of Nuclear Energy*, v. 4, Jan. 1957, p. 3-25 + 2 plates.

Characteristics of Np^{238} and U^{238} fission detectors, and an Al^{27} $(n,p)Mg^{27}$ activation detector; general group theory; experimental arrangements for the measurements; extraneous effects.

6013* The Swimming Pool Reactor at Trombay. R. Ramanna. *Journal of Scientific & Industrial Research*, v. 15, sec. A, Oct. 1956, p. 432-438.

Reactor design; control and safety system; experimental facilities and uses.

6014 Operation of a Diffusion Cloud Chamber With 23 Atm. of Deuterium. A. P. Batson, B. B. Culwick, H. B. Klepp, and I. Riddiford. *Journal of Scientific Instruments*, v. 34, Jan. 1957, p. 17-19.

6015* (Russian.) Utilization of Polymers Based on PVC in Creating Means for Protecting Personnel Against Radiation. **K voprosu ob ispol'zovanii polimernykh materialov na baze polivinilkhlorida dlia izgotovleniia sredstv individual'noi zashchity ot radioaktvnykh izluchenii.** M. N. Shleding, L. M. Nosova, L. I. Kuzmina, V. L. Karpov, L. G. Danilova, and S. M. Gorodinskii. *Khimicheskaia Promyshlennost'*, no. 7, Oct.-Nov. 1956, p. 408-411.

Evaluation of sorption-desorption properties of polymers. Effects of single components of PVC plastics on their sorption--desorption characteristics. Composition of PVC plastics providing easy elimination of radioactive contamination with necessary physical-mechanical and technological properties.

6016 Calculation of Fast and Thermal Group Constants With Applications to Diphenyl. M. C. Conerty, M. L. Storm, C. D. Petrie, and P. F. Zweifel. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1643, Oct. 1956, 41 p. (UF767 Un3.1ka Contin.)

6017* (English.) **Binding Energies of the Light Hyperfragments.** J. T. Jones, Jr. and J. M. Keller. *Nuovo Cimento*, v. 4, ser. 10, Dec. 1956, p. 1329-1338.

Variational calculations for hyperfragments of masses 3,4, and 5, and for hyperhelium-3.

6018* Merlin—Medium Flux Research Reactor. I. D. R. Chick and A. J. Salmon. *Nuclear Engineering*, v. 2, Jan. 1957, p. 10-14.

Designed for a thermal power of 5 mw., the reactor is of the pool type, being moderated, cooled, and partially shielded by light water. Fuel is a U-Al alloy, enriched to more than 90% U^{235}. Critical mass of the core is about 3.5 kg. U^{235}.

6019 Nuclear Engineering. Pt. IV. F. J. Van Antwerpen and Sylvia Fourdrinier, editors. Chemical Engineering Progress Symposium Series No. 19. v. LII. 206 p. 1956. American Institute of Chemical Engineers, New York. (QC776 Am35n)

These 27 papers cover topics such as reactor design, fuel processing, ventilation, and waste storage.

6020* A Quantum Theory of Refractive Index, Cerenkov Radiation, and the Energy Loss of a Fast Charged Particle. D. A. Tidman. *Nuclear Physics*, v. 2, Dec. 1956, p. 289-346.

6021* Contact and Core Interactions According to Dirac's Relativistic Theory of the Electron. S. T. Ma. *Nuclear Physics*, v. 2, Dec. 1956, p. 347-355.

Improvement of a well known approximate two-component form of the Dirac equation changes the repulsive contact interaction into a core interaction.

6022* Improvement of Quantum Electrodynamics Perturbation Theory With Help of the Renormalization Group. V. Z. Blank and D. V. Shirkov. *Nuclear Physics*, v. 2, Dec. 1956, p. 356-370.

The renormalization group technique previously used to improve perturbation theory formulas for the Green functions can also be effectively used to improve the vertex part formulas.

6023* Cross Section of the $I^{127}(\gamma, n)$ I^{126} Reaction. J. Erö and L. Keszthelyi. *Nuclear Physics*, v. 2, Dec. 1956, p. 371-381.

The cross section was measured on the I nuclei of a Na I(Tl) scintillation crystal, using the number of scintillations during irradiation and the activity of the I^{126} isotope afterward. Source of γ quanta was the Li^7 (p,γ) Be^8 reaction.

6024* The Possible Existence of Rotational Levels in Al^{28}. Raymond K. Sheline. *Nuclear Physics*, v. 2, Dec. 1956, p. 382-394.

The nine lowest levels in Al^{28} are interpreted as belonging to four rotational bands which in turn arise from two nuclear configurations. Experimental evidence from the β decay of Mg^{28} and the (d,p) stripping reaction on Al^{27} support this theory.

6025* Investigation of Internal Conversion Lines in the β-Spectrum of a Mixture of Eu^{152} and Eu^{154} Isotopes. V. M. Kelman, V. A. Romanov, R. Ya Metskhvarishvili, and V. A. Kolyunov. *Nuclear Physics*, v. 2, Dec. 1956, p. 395-407.

6026* The Gamma Spectrum of Sb^{124}. B. S. Dzhelepov, N. N. Zhukovsky, V. G. Nedovesov, I. F. Uchevatkin, and V. G. Chumin. *Nuclear Physics*, v. 2, Dec. 1956, p. 408-419.

6027* Causality and Dispersion Relations in Wave Mechanics. E. Corinaldesi. *Nuclear Physics*, v. 2, 1956, p. 420-440.

Analysis of scattering data.

6028* Shell Effects in Nuclear Coulomb Energy Differences. O. Kofoed-Hansen. *Nuclear Physics*, v. 2, Dec. 1956, p. 441-449.

Mathematical calculation.

6029* Analysis of Nuclear Quadrupole Moments on the Basis of a Kinematical Model. R. K. Osborn and E. D. Klema. *Nuclear Physics*, v. 2, Dec. 1956, p. 454-475.

6030* Internal Conversion Coefficients for M1 Transitions in $_{83}Bi^{214}$, $_{81}Po^{214}$ and $_{83}Bi^{212}$. K. O. Nielsen, O. B. Nielsen, and M. A. Waggoner. *Nuclear Physics*, v. 2, Dec. 1956, p. 476-484.

6031* The (γ, n) Reaction in Be^9 at Intermediate Energies. R. D. Edge. *Nuclear Physics*, v. 2, Dec. 1956, p. 485-495.

Cross sections for the reaction Be^9 (γ, n) Be^8 for monochromatic γ-rays in the energy range 2.6 to 8.1 m.e.v. were obtained using a large Szilard-Chalmers neutron detector.

6032* The Parasite Reactor, a Pressure-Bomb Assembly for Phase Studies Under Irradiation. Richard M. Bidwell and Walter R. Wykoff. *Nuclear Science and Engineering*, v. 1, Dec. 1956, p. 443-451.

The Parasite reactor is a 1-liter pressure bomb for in-pile studies at temperatures and pressures up to at least 400 C and 5000 psi. The stability of a uranyl nitrate solution is satisfactory for use in proposed water-boiler reactor.

6033* Effect of Geometry on Resonance Neutron Absorption in Uranium. Lawrence Dresner. *Nuclear Science and Engineering*, v. 1, Dec. 1956, p. 501-510.

6034 MITR: The MIT Research Reactor. T. J. Thompson and T. Cantwell. *Nucleonics*, v. 15, Jan. 1957, p. 38-40.

Heavy-water cooled and moderated reactor provides 10^{13} flux at 1 mw, a variety of experimental ports, and a core array designed so that flux can be increased in selected parts.

6035 Computing 3-Group Constants for Neutron Diffusion. R. W. Deutsch. *Nucleonics*, v. 15, Jan. 1957, p. 47-51.

Method for calculating three-group constants for U^{235} loaded homogeneous hydrogenous reactor is based on analysis of latest available nuclear-cross-section data and reactivity experiments.

6036 The Buildup of Heavy Isotopes During Thermal Neutron Irradiation of Uranium Reactor Fuels. J. O. Blomeke. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2126, Jan. 1957, 58 p. (UF767 U3o Contin.)

Curves suitable for predicting the buildup of heavy isotopes in U reactor fuel of any likely initial isotopic composition are presented.

6037 Immiscible-Liquid-Cooled, Fluid-Fuel Reactor. W. D. Burch, C. H. Cater, D. L. Hathway, B. S. Maxon, N. R. Williamsen, and O. O. Yarbro. *Oak Ridge School of Reactor Technology (U. S. Atomic Energy Commission)*, CF-55-8-188, Aug. 1955, 141 p. (UF767 Un3.1cf Contin.)

Central station power fluid fuel reactor was designed to minimize fuel holdup outside the reactor core by utilizing the excellent heat transfer characteristics of direct contact cooling.

6038* (German.) Physical Properties and Technical Use of Reactor Fuel. **Physik und Technik des Reaktor-Brennstoffes.** H. Schmidl. *Ö.Z.E. Österreichische Zeitschrift für Elektrizitatswirtschaft*, v. 9, Dec. 1956, p. 541-550.

The nuclear process in the reactor is examined especially regarding speed of neutrons. Nuclear fission processes in U-233, U-235 and Pu-239.

6039 Direct Interaction in Neutron Inelastic Scattering. John R. Lamarsh and Herman Feshbach. *Physical Review*, v. 104, ser. 2, Dec. 15, 1956, p. 1633-1639.

6040 Energy Loss and Straggling of 150-Mev Electrons in Li, Be, C, and Al. A. M. Hudson. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 1-6.

6041 Experimental Limit for the Electron-Proton Charge Difference. Vernon W. Hughes. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 170-172.

The upper limit for the charge on a CsI molecule in a homogeneous electric field is 1.7×10^{-22} electrostatic units or 4×10^{-13} of the electronic charge.

6042 Negative to Positive Ratio From Nonrelativistic Theories of Pion Photoproduction. Michael J. Moravcsik. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 267-277.

A numerical evaluation of the Low theory of charged photoproduction is given in various approximations, including also nonrelativistic recoil of the nucleon.

6043 Experiments With 315-Mev Polarized Protons: Proton-Proton and Proton-Neutron Scattering. O. Chamberlain, E. Segrè, R. D. Tripp, C. Wiegand, and T. Ypsilantis. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 288-301.

6044* (English.) **The Reaction $O^{16}(n,\alpha)C^{13}$.** Kiichi Kimura, Isao Kumabe, Kozo Miyake, Hiroshi Ogata, and Kyoichi Miyasita. *Physical Society of Japan, Journal*, v. 11, Dec. 1956, p. 1211-1220.

Using an ionization chamber filled with and irradiated with moderated Li-D fast neutrons, the output pulses produced by the reaction were registered and the pulse height distribution determined.

6045 Pseudoscalar Interaction in the Decay of ^{144}Pr. M. J. Laubitz. *Physical Society, Proceedings*, v. 69, no. 443A, Nov. 1956, p. 789-797.

Analysis of the ground state β transition of Pr^{144} depends upon the spin assumed. If spin and parity are O^- then pseudoscalar interaction is needed to explain the results satisfactorily.

6046 π^+-p Scattering at 10-35 MeV in a Diffusion Cloud Chamber. M. H. Alston, W. H. Evans, Maria Fidecaro, R. W. Newport, G. Von Gierke, and P. R. Williams. *Physical Society, Proceedings*, v. 69, no. 443A, Nov. 1956, p. 798-803.

6047 Resonance Forces at Large Separations. A. Dalgarno and N. Lynn. *Physical Society, Proceedings*, v. 69, no. 443A, Nov. 1956, p. 821-829.

A simple perturbation method is suggested for the calculation of energies of the states of homonuclear molecules at large internuclear distances for which the identity of the nuclear fields must be taken into account.

6048 On the Reaction $^{13}C(\alpha,n)^{16}O$. M. G. Rusbridge. *Physical Society, Proceedings*, v. 69, no. 443A, Nov. 1956, p. 830-835.

Measurements of yield curves and absolute cross sections for bombarding energies between 1.0 and 2.5 m.e.v. and of angular distributions at five resonances. Spin and parity assignments for certain levels in the compound necleus O^{17}.

6049 The β-Disintegration of RaD. W. Stanners and M. A. S. Ross. *Physical Society, Proceedings*, v. 69, no. 443A, Nov. 1956, p. 836-844.

The RaD events associated with β-particles of RaE were studied to determine total number of developed grains produced in each RaD event. Analysis of resulting grain-count distribution provides evidence of the occurrence of a ground-state to ground-state β-process in RaD with an intensity of $15.5 \pm 3.5\%$ of all disintegrations.

6050 The Elastic Scattering of Neutrons by Tritons and ^3He. B. H. Bransden, H. H. Robertson, and P. Swan. *Physical Society, Proceedings*, v. 69, no. 444A, Dec. 1956, p. 877-887.

Calculations over the energy range of 1 to 14 m.e.v. using central forces.

6051 Ionization Loss and the Range-Energy Relation for Low Energy Protons in Metals. K. L. Kaila and N. K. Saha. *Physical Society, Proceedings*, v. 69, no. 444A, Dec. 1956, p. 888-893.

Computation of a modification to Bethe's formula.

6052 Progress in Nuclear Physics. O. R. Frisch, editor. v. V. 325 p. 1956, Pergamon Press, New York. (QC776 P94 Vis.)

Seven articles on determination of nuclear reaction energies by deflection measurement, inelastic scattering of fast neutrons, new electronic techniques, the bubble chamber, the radius of a nucleus, the neutrino, and organic scintillators.

6053* The Creation of an Electron Pair by a Fast Charged Particle. Toshiyuki Murota, Akira Ueda, and Hajime Tanaka. *Progress of Theoretical Physics*, v. 16, Nov. 1956, p. 482-496.

The differential cross section obtained here by the Feynman-Dyson method is valid as long as the energies of participant particles are large compared with the respective rest masses.

6054 Study of Nuclear Structure by Electromagnetic Excitation With Accelerated Ions. K. Alder, A. Bohr, T. Huus, B. Mottelson, and A. Winther. *Reviews of Modern Physics*, v. 28, Oct. 1956, p. 432-542.

Theory; experimental conditions; nuclear data obtained from Coulomb excitation; collective nuclear excitations.

6055 High Transmission Mechanical Neutron-Monochromator for Filtering of Higher Order Reflections. N. Holt. *Review of Scientific Instruments*, v. 28, Jan. 1957, p. 1-3.

An instrument designed for use in connection with a neutron crystal spectrometer for filtering out higher order reflections by placing it between the crystal and the counter.

6056 Anomalies in the Adiabatic Interpretation of Charge-Transfer Collisions. H. B. Gilbody and J. B. Hasted. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 8, 1957, p. 334-343.

Measurement of 17 charge-transfer cross-sections in the energy ranges 10 to 300 e.v. and 3 to 40 k.e.v.

6057* Antiprotons and Antineutrons. H. S. W. Massey. *Science Progress*, v. 45, Jan. 1957, p. 1-10.

Their discovery, characteristics, and interactions with matter.

6058 Formation of the Elements. William A. Fowler. *Scientific Monthly*, v. 84, Feb. 1957, p. 84-100.

Sources of data for the cosmic abundance curve of elements; mechanisms of nuclear synthesis; four theories for the origin of the elements; synthesis of elements in stars.

6059* (Swedish.) Production of Radioactive Isotopes. **Framställning av radioaktiva isotoper.** Carl Gustaf Österlundh. *Svensk Kemisk Tidskrift*, v. 68, no. 11, 1956, p. 569-580.

A study of the general principles underlying the growing use of radioactive isotopes and a survey of various nuclear reactions; calculation of the activity formed by constant radiation; by-products; chemical processing; and possible use of radioactive nucleides.

6060 Radioactivity of Indium-109 and Tin-109. Michael D. Petroff. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3538, Oct. 1956, 58 p. (UF767 U3u Contin.)

The positron, conversion-electron, and γ-ray spectra were studied with a β-ray spectrometer and NaI(Tl) crystal spectrometer.

6061 Decay Scheme Studies of Some Light Gadolinium Isotopes. Virginia Anne Schultz. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3594, Jan. 1957, 31 p. (UF767 U3u Contin.)

See also: **4794** (nuclear power for aircraft); **4964** (properties of irradiated graphite); **5539** (food irradiation reactors); **5849** (elevated temperature properties of Be); **6106** (nuclear physics); **6171** (use of plastics in nuclear research); **6180** (radioactive fallout); **6290** (financial protection against atomic hazards); **6311** (radiation protection).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

6062 OP Search. *Chemical Engineering Progress*, v. 53, Jan. 1957, p. 3J-24J.

A group of articles dealing with operations research as seen by an experimental methodologist, a psychologist, and an executive. Case histories of four specific applications.

6063 Employment Psychology: The Interview. Roger M. Bellows and M. Frances Estep. 295 p. 1954. Rinehart & Co., New York. (HF5549 B41e)

Interview problems and procedures. Construction of applications blanks and apptitude tests.

6064 Industrial Engineering Handbook. H. B. Mayard, editor. Sections individually paged. 1956. McGraw-Hill, New York. (T56 M45i)

Authoritative data, principles, methods, and procedures on every important aspect of industrial engineering. Includes such topics as the industrial engineering function, work measurement, predetermined elemental time standards, wage payments, plant facilities and design, and control procedures.

6065 A Survey of Human Engineering. Richard S. Barrett. *Machine Design*, v. 29, Jan. 1957, p. 76-80.

A review of basic principles in designing for the operator.

6066* Allocation of Sales Effort in the Lamp Division of the General Electric Company. Clark Waid, Donald F. Clark, and Russell L. Ackoff. *Operations Research Society of America, Journal*, v. 4, Dec. 1956, p. 629-647.

A detailed case history concerning allocation of the salesman's time to a specific set of accounts.

6067* The Queuiac. An Electromechanical Analog for the Simulation of Waiting-Line Problems. Paul F. Dunn, Charles D. Flagle, and Philip A. Hicks. *Operations Research Society of America, Journal*, v. 4, Dec. 1956, p. 648-662.

Design, operation, and programming of simulation equipment developed in connection with military message-handling problems, which offers empirical solutions to many currently unsolved waiting-line problems.

6068* Three Applications of Operations Research in a Large Electric Utility. P. J. Sandiford, B. Bernholtz, and W. Shelson. *Operations Research Society of America, Journal*, v. 4, Dec. 1956, p. 663-673.

Techniques used for lake-level forecasting, peak power demand forecasting, and vehicle-replacement analysis.

6069* The Solution of the Single-Channel Queuing Equations Characterized by a Time-Dependent Poisson-Distributed Arrival Rate and a General Class of Holding Times. George Luchak. *Operations Research Society of America, Journal*, v. 4, Dec. 1956, p. 711-732.

General solutions of the equations are obtained for the case in which the traffic intensity is a continuous function of time and possesses continuous derivatives of all orders.

6070 The Psychology of Occupations. Anne Roe. 340 p. 1956. John Wiley & Sons, New York. (HF5381 R62p)

Relations between vocation and personal factors. Job classifications to fit psychological principles.

6071 Worker Satisfaction and Development. A Case Study of Work and Social Behavior in a Factory Group. A. Zaleznik. 148 p. 1956. Harvard University, Granduate School of Business Administration, Boston. (HD6974 Z14W)

Demonstrates through description and diagnosis how social organization develops from patterns of work and social behavior.

See also: **4805** (air weapons analysis); **4811** (prediction of response of aircraft pilots).

ORE AND MATERIALS BENEFICIATION

6072 The Extraction of TH^{230} (Ionium) From a Canadian Pitchblende Residue. A. B. Van Cleave and A. P. Baerg. *Canadian Journal of Technology*, v. 34, Jan. 1957, p. 425-428.

Procedure involves solvent extraction from slurry and a final purification by ion exchange.

6073 Beneficiation of Low-Grade Pegmatitic Uranium Ores. A. B. Van Cleave. *Canadian Mining and Metallurgical Bulletin*, v. 49, Dec. 1956, p. 827-834.

Deals with attempts to beneficiate ores from the Charlebois Lake area, containing less than 0.10 per cent U_3O_8.

6074 The Snow Lake Cyanidation Circuit. B. G. MacDermid and N. R. Stewart. *Canadian Mining and Metallurgical Bulletin*, v. 50, Jan. 1957, p. 21-27.

Problems encountered in the cyanidation of an arsenical flotation concentrate. Mill operation and test work.

6075 The Preparation and Evaluation of Superior Flocculating Agents for Phosphate Slimes. Victor K. LaMer, Robert H. Smellie, Jr., Pui-Kum Lee, and K. Ramamurti. *Columbia University (U. S. Atomic Energy Commission)*, NYO-7403, Oct. 1956, 28 p. (UF767 U3ny Contin.)

The formaldehyde reaction with the $-NH_2$ of the amide groups of polyacrylamide compounds producing methylene bonds, proved superior.

6076* (Czech.) Cooling Sinter. **Chlazeni aglomerátu.** *Hutník*, v. 6, Oct. 1956, p. 289-296.

Problems of cooling sintered ore. Discussion of water and air cooling. Suggested methods and evaluation of these methods.

6077 Uranium From Gold Wastes. William Q. Hull and Ewen T. Pinkney. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 1-10.

At Daggafontein's plant in the Transvaal, U is absorbed from a pure solution of uranyl sulfate containing an excess of free sulfuric acid when passed through a strong base ion exchange resin. Other systems are explained.

6078 Fluidized Solids Technique. Magnetic Conversion of Iron Ores. Robert J. Priestley. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 62-64.

An economical method for upgrading low-grade ores, such as hematite and taconite.

6079 Innovations in Processing Uranium Ores. J. B. Rosenbaum, J. B. Clemmer, and W. L. Lennemann. *Intermountain Experiment Station, U. S. Bureau of Mines (U. S. Atomic Energy Commission)*, AECU-3367, Sept. 1956, 20 p. (UF767 U3au Contin.)

Physical beneficiation; H precipitation of U from soda ash solution; pressure oxidation leaching; $(NH_4)_2\ CO_3$ leaching; char-in-pulp system; nonaqueous extraction; solvent extraction of H_2SO_4 eluate; thick slurry solvent extraction.

6080 Sinter-Plant Assessment Trials at Margam. C. Lang and H. Bates. *Iron and Steel Institute, Journal*, v. 185, Jan. 1957, p. 86-95.

The major variables measured were airflow, fan inlet temperature and suction, strand suction, and input of raw material.

6081* Engineering Aspects of Ion Exchange in Hydrometallurgy. John Dasher, A. M. Gaudin, and R. D. Macdonald. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Jan. 1957, p. 185-192.

A strong base anion exchange resin is used for selective recovery of U from sulfate leach liquors. The influence of the major variables on column operation is described, plant performance data are summarized, cost factors are enumerated, and the probable application of this operation to metals at least as valuable as Cu is predicted.

6082 Activation and Deactivation of Sphalerite With Ag and CN Ions. A. M. Gaudin, D. W. Fuerstenau, and M. M. Turkanis. *Mining Engineering*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 208, Jan. 1957, p. 65-69.

Activation with Ag ions results from the exchange of two Ag ions for one Zn ion in the sphalerite lattice. The exchange is proportional to the logarithm of time and proceeds until either of the reactants is consumed. Sodium cyanide prevents activation by controlling the ratio $[Zn^{++}]/[Ag^{+}]^2$ in solution.

6083 Energy-Size Reduction Relationships in Comminution. R. J. Charles. *Mining Engineering*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 208, Jan. 1957, p. 80-88.

Theoretical considerations; derivation of relationships; some experimental data.

6084* The Phoenix Prince Cyanide Plant. Philip Rabone. *Mining Magazine*, v. 96, Jan. 1957, p. 9-21.

Treatment and recovery procedures for a refractory Au ore.

6085* How Ion Exchange Works for U_3O_8 at Mines Development's New Mill. *Mining World*, v. 19, Jan. 1957, p. 38-43.

Concentration plant layout and operation.

6086 Progress Report: Further Studies of the Dialkylphosphoric Acid Extraction (Dapex) Process for Uranium. C. A. Blake, D. J. Crouse, C. F. Coleman, K. B. Brown, and A. D. Kelmers. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2172, Jan. 1957, 113 p. (UF767 U3o Contin.)

Deals with miscibility modifiers for the kerosene diluent, synergistic extractant combinations, stripping of extracted uranium, and continuous countercurrent demonstration on actual plant liquors.

6087* (English.) **Fluidized-Bed Roasting of Pyrite.** Motoo Watanabe and Akiichi Kigoshi. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 8, Dec. 1956, p. 511-531.

Describes experiments showing that it is useful to treat a pyrite to produce water soluble sulfates of Co, Cu, and Zn.

6088 Sintering: Race to Hold Costs Down. *Steel*, v. 140, Jan. 28, 1957, p. 98, 100.

Beneficiation and agglomeration mean more hot metal without more blast furnaces. Plants now being built will raise sintering capacity 50% by 1959.

6089 An Investigation of Some Variables in the Treatment of Scheelite With Soda Ash. F. W. Wessel and R. S. McClain. *U. S. Bureau of Mines, Report of Investigations* 5280, Dec. 1956, 21 p. (TN21 Un3r)

The dry reaction between Na_2CO_3 and scheelite is best conducted just below 898 C. Excess Na_2CO_3 required over the stoichiometric equivalent is in inverse relationship to the grade of W in the ore.

See also: **5585** (milling of uranium ores); **5771** (recovery of U from Al-U alloys); **6179** (coal-washery water treatment).

PHYSICS

6090 Study of Classical Scattering Theory. M. M. Gordon. *American Journal of Physics*, v. 25, Jan. 1957, p. 32-37.

Deals with scattering by a conservative central force. A variational equation and a Fourier series expansion are developed whereby approximate expressions for the trajectory can be obtained.

6091 An Electrical Analogue of Magnetic Domains. P. F. Davis. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 19-20.

Description of two-dimensional analog consisting of a square mesh network of resistance wires.

6092 The Triple Point of Carbon Dioxide as a Thermometric Fixed Point. D. Ambrose. *British Journal of Applied Physics*, v. 8, Jan. 1957, p. 32-34.

Apparatus and technique used to establish -56.603 C as the triple-point temperature, with a reproducibility of ± 0.002 C.

6093 Predict Thermal Conductivity. I. Wallace R. Gambill. *Chemical Engineering*, v. 64, Feb. 1957, p. 237-240.

Several methods for the estimation of thermal conductivity of pure liquids.

6094* (Russian.) Flash-Like Outburst of Luminescence in Zinc Sulphide Phosphors and the Two-Step Excitation Mechanism. **Vspysheehnoe rasgoranie svecheniia v tsink-sul'fidnykh fosforakh i dvukhstupenchatyi mechanizm vozbuzhdeniia.** N. A. Tolstoi. *Doklady Akademii Nauk SSSR*, v. 111, Nov. 21, 1956, p. 582-584.

Effect of temperature, IR rays, U V, and orange-green illumination on the above process.

6095 Effect of Crystal Disorder on the Electroluminescence of Zinc Sulfide Phosphors. A. H. McKeag and E. C. Steward. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 41-45.

Activated Cu entered most effectively at that temperature of refiring where transformation from hexagonal to cubic structure occurred most readily. This transformation was associated with a process of one-dimensional disorder in the crystals.

6096 Contact Electroluminescence. Willi Lehmann. *Electrochemical Society, Journal*, v. 104, Jan. 1957, p. 45-50.

Evidence that ordinary electroluminescence in powdered phosphors excited by an alternating electric field is due to substances of relatively high conductivity incorporated as small segregations within the essentially insulating phosphor particles.

6097* (English.) **Encyclopedia of Physics. Handbuch der Physik.** S. Flügge, editor. v. XV. **Low Temperature Physics II. Kältephysik II.** 477 p. 1956. Springer-Verlag, Berlin. (QC21 G27h3)

Low temperature magnetism; adiabatic demagnetization; superconductivity; liquid He.

6098* (German, English, and French.) Encyclopedia of Physics. **Handbuch der Physik. v. XXXII.** Structural Research. **Strukturforschung.** S. Flügge, editor. 663 p. 1957. Springer-Verlag, Berlin. (QC21 G27h3)

X-ray determinations of structure; size of particles and lattice defects; electron interference; neutron diffraction and interference.

6099* The Specific Heats of Crystals. I. General Theory. II. The Case of Diamond. C. V. Raman. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Oct. 1956, p. 153-164.

Calculations based on Einstein's approach considering a crystal as an assembly of sets of individual harmonic oscillators, each set consisting of a great number of oscillators having a common frequency of vibration.

6100* On the Diffraction of Light by Progressive Supersonic Waves. Oblique Incidence: Intensities in the Neighbourhood of the Bragg Angle. P. Phariseau. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Oct. 1956, p. 165-170.

When the angle of incidence is close to the Bragg angle and for high frequencies of the supersonic waves, the intensities of the orders can easily be obtained from the generalized theory of Raman and Nath.

6101* Magneto-Optic Studies in the Nitrates of Lead, Barium and Strontium. V. Sivaramakrishnan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Oct. 1956, p. 216-222.

6102 Stress Activated Luminescence in X-Irradiated Alkali Halide Crystals. F. I. Metz, R. N. Schweiger, H. R. Leider, and L. A. Girifalco. *Journal of Physical Chemistry*, v. 61, Jan. 1957, p. 86-89.

The luminescence caused by stressing crystals of KBr, NaCl, and LiF containing F-centers produced by X-rays was investigated in the region of plastic flow.

6103* (French.) Characterizing Spectra by Means of Indicatory Functions. **Caractérisation de spectres au moyen de fonctions indicatrices.** Florence Aeschlimann. *Journal de Physique et le Radium*, v. 17, Nov. 1956, p. 950-955.

Ordinary spectra, especially those connected with sine and gamma functions, of J. L. Destouches. This concept was also applied to the case of radioactive systems with quasi-stationary levels.

6104 Radiant-Heat Transfer Between Nongray Parallel Plates. Stanley Goodman. *Journal of Research, National Bureau of Standards*, v. 58, Jan. 1957, p. 37-40.

In cross-sectional heat flow through box beams typical of aircraft structures, radiant-heat transfer predominates in Inconel beams and is significant in Al beams.

6105* (Hungarian.) Dependence of Permeability of Magnetite Upon the Frequency of the Electromagnetic Microwave Fields. **A magnetit permeabilitásának frekvencia függése mikrohullámú elektromágneses terekben.** Imre Nagy, Lénárd Pál, and Dezsö Pallagi. *Magyar Fizikai Folyoirat*, v. 4, no. 4, 1956, p. 359-369.

Investigation in the range of 1000-3000 Mc. on magnetite powder suspended in paraffin.

6106 (English and Spanish.) **New Research Techniques in Physics.** 447 p. 1954. Academia Brasileira de Ciencias, Rio de Janeiro. (QC1 Ac12n)

A group of papers relating recent developments in apparatus and techniques, particularly in the field of nuclear physics.

6107 A New Theory for the Evaluation of Noise Components in Air Distribution Systems. Richard D. Tutt and C. J. Hemond, Jr. *Noise Control*, v. 3, Jan. 1957, p. 10-18.

The single number system is not a true index of sound rating. Rather, the noise generated by all of the air-handling components in a distribution system should be analyzed.

6108 The Electroluminescence of ZnS Type Phosphors. Chap. IV-V. P. Zalm. *Philips Research Reports*, v. 11, Dec. 1956, p. 417-451.

Theoretical considerations.

6109 Absorption and Luminescence of Colour Centres in KCl and NaCl. C. Z. van Doorn and Y. Haven. *Philips Research Reports*, v. 11, Dec. 1956, p. 479-488.

6110 Microwave Resonance Relations in Anisotropic Single-Crystal Ferrites. J. O. Artman. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 62-73.

Detailed analyses for spherical ferrite specimens possessing first order anisotropy.

6111 Structure of the Intermediate State in Superconducting Lead. P. B. Alers. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 104-108.

The Faraday effect in a cerous nitrate-glycerol mixture was used to study a specimen of Pb alloy containing Sb and Sn.

6112 Calculation of the Band Structure of "Complex" Crystals. B. Segall. *Physical Review*, v. 105, ser. 2, Jan. 1, 1957, p. 108-115.

6113* (English.) **Thermal and Electrical Properties of Tungsten Oxide (WO_3).** Shozo Sawada. *Physical Society of Japan, Journal*, v. 11, Dec. 1956, p. 1237-1246.

6114 Radiative Transfer With Distributed Sources. R. G. Giovanelli and J. T. Jefferies. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1077-1084.

The Eddington approximation is applied to obtain expressions for the total intensity of the diffuse radiation in composite diffusers containing or illuminated by nonuniformly distributed sources.

6115 The Form of the Effective Electronic Potential in a Crystal. G. G. Hall. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1124-1132.

Equations for the best single-electron orbitals in a crystal are interpreted in terms of an effective potential, and the forms of the various contributions to this potential are considered.

6116 (French.) Numerical and Physical Calculations and Application to Thermal Kinetics. **Calcul numérique, calcul physique application a la thermocinétique.** Pierre Vernotte. *Publications Scientifiques et Techniques du Ministère de l'Air*, no. 319, 1956, 344 p. (TL502 F84.1p Vis.)

Mathematical and physical solution of the general equations governing the transfer of heat inside matter.

6117 Foundations of Thermodynamics. P. T. Landsberg. *Reviews of Modern Physics*, v. 28, Oct. 1956, p. 363-392.

A geometrization of thermodynamics, considering only elementary concepts.

6118 Rheology. Theory and Applications. Frederick R. Eirich, editor. 761 p. 1956. Academic Press, New York. (QC189 Ei77r)

Includes 16 papers on various phases of the deformation of solids, flow under high pressures, mechanism of liquid flow, large elastic deformations, viscoelasticity, melt flow, rheology of disperse systems, and acoustic responses of liquids.

6119 Solid State Physics. Advances in Research and Applications. Frederick Seitz and David Turnbull, editors. v. III. 588 p. 1956. Academic Press, New York. (QC125 So44)

Topics include Group V compounds, continuum theory of lattice defects, order-disorder phenomena in metals, phase changes, crystal imperfections, and ferro-magnetic domain theory.

6120 Technical Aspects of Sound. v. II. Ultrasonic Range, Underwater Acoustics. E. G. Richardson, editor. 412 p. 1957. Elsevier Publishing Co., New York. (QC225 R39t)

Propagation of sound waves; aircraft noise; ultrasonic transducers and their applications; sound damping and absorbing materials.

6121* (Norwegian.) Ultrasonics. **Ultralyd.** Frithjof Dyngvold. *Teknisk Ukeblad*, v. 104, Jan. 3, 1957, p. 3-11.

Principles underlying use of ultrasonic waves; methods used in their production, especially with magnetostrictive and piezoelectric resonators; some applications in chemical reactions, galvanizing and metal surface cleaning.

6122 (French.) Thermodynamic Constants of Gases at High Temperatures. **Constantes thermodynamiques des gaz aux températures élevées.** G. Ribaud. v. II, 49 p. 1943. Hermann and Cie, Paris. (QC286 R35c)

Theory of specific heat and other thermodynamic properties of perfect and real gases. Experimental determination of specific heat. The equal distribution of energy in a molecule and the calculation of its thermodynamic constants.

6123* (Russian.) Group Theory Methods in Quantum Physics of Solid Bodies. **Metod teorii grupp v kvantovoi fizike tverdoga tela.** A. V. Sokolov and V. P. Shirokovskii. *Uspekhi Fizicheskikh Nauk*, v. 60, Dec. 1956, p. 617-688.

Authors attempt to show that the basic principles of quantum mechanics and quantum physics of solid bodies can be analyzed adequately only by using the methods of group theory.

6124* (German.) Theory of Reflection of Positive Ions From a Metal Surface. **Theorie der Reflexion positiver Ionen an Metalloberflächen.** Oldwig v. Roos. *Zeitschrift für Physik*, v. 147, no. 2, 1957, p. 184-209.

Development of theory based on the conception of the ionic diffusion into the metal lattice. Ion counting by means of the Boltzmann equation.

See also: **4971** (magnetic properties of Pb ferrites); **5222** (quantum mechanics); **5351** (design of magnets); **5354** (magnetism).

PLASTICS

6125 The Initiation of Polymerization by Di-*t*-Butyl Peroxide. J. A. Offenbach and A. V. Tobolsky. *American Chemical Society, Journal*, v. 79, Jan. 20, 1957, p. 278-281.

The kinetics of initiation of polymerization by di-*t*-butyl peroxide were studied in styrene and methyl methacrylate between 60 and 98 C. Measured values are in excellent agreement with those obtained in other solvents at higher temperatures by infra-red measurements.

6126 Epoxidized Esters of Fatty Acids as Internal and External Plasticizers for Polyvinyl Acetate. Leonard S. Silbert and William S. Port. *American Oil Chemists' Society, Journal*, v. 34, Jan. 1957, p. 9-11.

Fatty acid esters modified with epoxy or acetoxy groups may be used for plasticizing polyvinyl acetate in latex form. The use of a good swelling agent, such as toluene, is desirable.

6127 A Mechanism to Operate a Tension Tester at Constant Strain Rates. Stephen Strella. *ASTM Bulletin*, no. 219, Jan. 1957, p. 29-33.

Preliminary results show the desirability of performing tension tests on plastics at constant strain rates as opposed to the usual method of constant grip separation rates.

6128 Measurement of the Elastic Modulus of Films. J. R. Olson and D. W. Vanas. *ASTM Bulletin*, no. 219, Jan. 1957, p. 34-35.

Slippage of the specimens of photographic film in the tester is a determinate constant of the material and the apparatus, thus permitting the true value of the modulus to be calculated and providing a check on the efficacy of any given gripping procedure.

6129 Product Design in Plastics. A. H. Woodfull. *British Plastics*, v. 30, Jan. 1957, p. 4-7.

Curvilinear outlines combine good "eye appeal" with ease of molding.

6130 Some Aspects of Hot Runner Moulding. I. *British Plastics*, v. 30, Jan. 1957, p. 14-16.

Single and multi-nozzle injection molding methods. Hot runner molds.

6131 Wanted: New Uses for New Silicones. *Chemical and Engineering News*, v. 35, Jan. 28, 1957, p. 16-19.

Properties of silicones, application trends, and future prospects.

6132* (English.) **Non-Newtonian Viscosity of Dilute High Polymer Solutions. II. Measurements on Polystyrene Fractions in Toluene.** Toshiaki Kuroiwa. *Chemical Society of Japan Bulletin*, v. 29, Dec. 1956, p. 962-968.

6133* (French.) Advances in the Chemistry and Technology of Silicones. **Les progrès dans la chimie et l'industrie des silicones.** G. Sibille. *Chimie & Industrie*, v. 76, Nov. 1956, p. 1047-1059.

The manufacture, properties, and applications are discussed in turn.

6134* (Russian.) Polymerization of Isobutylene in the Presence of Triethylaluminum and Titanium Tetrachloride. **Polimerizatsiia isobutilena v prisutstvii trietilaliuminiia i chetyrekhloristogo titana.** A. V. Topchiev, B. A. Krentsel', N. F. Bogomolova, and Iu. Ia. Gol'dfark. *Doklady Akademii Nauk SSSR*, v. 111, Nov.-Dec. 1956, p. 121-124.

Experimental data on the complex of triethylaluminum with TiCl as catalyst.

6135 High Polymer Solutions. VI. The Osmotic Pressure of Dilute Solutions of Polystyrene and Poly*iso*butene. C. E. H. Bawn, E. S. Hill, and M. A. Wajid. **VII. Vapour Pressure of Polystyrene Solutions in Acetone, Chloroform and Propyl Acetate.** C. E. H. Bawn and M. A. Wajid. **VIII. The Vapour Pressure of Solutions of Poly*iso*butene in Toluene and Cyclohexane. IX. Viscosity and Chain Dimensions of Poly*iso*butene and Polystyrene in Mixed Solvents.** C. E. H. Bawn and R. D. Patel. *Faraday Society, Transactions*, v. 52, Dec. 1956, p. 1651-1675.

6136 The Second-Order Transition of Polyvinyl Acetate. P. Meares. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 31-40.

The development of molecular motions throughout a polymer in the neighborhood of the second-order transition is discussed. It is suggested that several degrees below the glass temperature rotational motion of chain segments is possible in regions surrounding chain ends.

6137 The Sedimentation and Diffusion of Cellulose Acetate in Acetone. F. H. Holmes and D. I. Smith. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 67-79.

Sedimentation and diffusion measurements were made on nine cellulose acetate fractions in acetone. Values of the average degree of polymerization were then calculated, and do not differ significantly from the values calculated from measurements of the osmotic pressure.

6138 The Diffusion of Gases in Polyvinyl Acetate in Relation to the Second-Order Transition. P. Meares. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 101-106.

Data for the permeability, diffusion, and solubility coefficients of krypton and methane in polyvinyl acetate compared with similar data for other gases. The transport processes are the same for each gas and differ according to whether the polymer is above or below its glass temperature.

6139 Radioactive Studies of Diffusion in Polymer Systems. II. The System *Iso*pentane + Poly*iso*butene. G. S. Park. *Faraday Society, Transactions*, v. 53, Jan. 1957, p. 107-112.

A method for measuring the self-diffusion coefficient in mixtures of a polymer with volatile liquids. Synthesis of tritio*iso*pentane.

6140 Cellulose Derivatives. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 68-103.

Methods of preparation of cellulose phenylthiourethane, a soft white fibrous substance, containing N and S, formed by reaction of Zn cellulose xanathate and primary amines, are discussed in this series of seven articles as well as properties of a fiber prepared from this derivative.

6141 Synthesis of Chemically Uniform Copolymers. Rapid Calculation of Monomer Addition. Russell J. Hanna. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 208-209.

Equations offer a rapid method for computing amount of monomer to be added to produce a chemically uniform copolymer in a free radical batch copolymerization.

6142 Compatibilities of Coumarone-Indene Resins Solvent Systems. A. C. Zettlemoyer and Jack Vanderryn. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 220-225.

Solubility relationships of polyindene resins of low mol. wt. were determined in organic solvents to aid their use in coating compositions, asphalt tile, and rubber products, and to compare them with high polymers.

6143 Nickel Oxide Polymerization Catalysts. Effects of Preparation Methods on Properties. V. C. F. Holm, G. C. Bailey, and Alfred Clark. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 250-252.

6144 Calculation of Molecular Weight and Dimensions of Polymers From Viscosity Interaction Parameter. Suresh N. Chinai. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 303-304.

6145 Vinyl Type Polymerization at Solid Surfaces and With Complex Catalysts. F. Eirich and H. Mark. *Journal of Colloid Science*, v. 11, Dec. 1956, p. 748-766.

Specific instances of interface polymerization; some concepts of stereospecific catalysis; suggested mechanisms of stereospecific syntheses.

6146 Copolymerization Reactions of *trans*-1,2-Di(2-Pyridyl)-Ethylene. C. S. Marvel, A. T. Tweedie, and James Economy. *Journal of Organic Chemistry*, v. 21, Dec. 1956, p. 1420-1422.

Above was prepared and copolymerized with butadiene and its reactivity ratios with styrene and acrylonitrile were determined.

6147* Association and Entanglement in High Polymers. I. Effect on Viscometric Properties of Dimethylpolysiloxanes. R. L. Merker. *Journal of Polymer Science*, v. 22, Dec. 1956, p. 353-362.

Viscosity-molecular weight behavior can be explained on the basis of a theory which relates the zero shear viscosity and the apparent molecular weight resulting from entanglement and/or association of long polymer molecules.

6148* Electron Irradiation of Polyacrylates. Allan R. Shultz and Frank A. Bovey. *Journal of Polymer Science*, v. 22, Dec. 1956, p. 485-494.

Gelation characteristics of carefully-prepared polyacrylate films were observed as a function of original weight-average molecular weight and radiation dose, allowing calculation of total energy dissipation during the occurrence of a crosslinked unit formation or a main-chain scission.

6149* The Influence of Depropagation on Copolymer Composition. R. M. Joshi. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Oct. 1956, p. 553-556.

A new copolymer composition equation incorporating the reverse rate constants was developed and shown to be applicable to experimental data of the system styrene-fumaronitrile.

6150* (Russian.) Changes in Physical-Mechanical Properties of Polystyrene Caused by Working Conditions. **Izmenenie fiziko-mekhanicheskikh svoistv polistirola pod vliianiem ekspluatatsionnykh faktorov.** B. N. Rutovskii and A. V. Shelion. *Khimicheskaia Promyshlennost'*, no. 7, Oct.-Nov. 1956, p. 411-414.

Sharp changes of the properties of solid and emulsified polystyrene were observed after the samples were exposed to light, heat, and moisture under atmospheric conditions, and also when they underwent irradiation in a weatherometer. Heating, freezing, or soaking solid and emulsified polystyrene does not result in a significant change of physical, mechanical, or electrical properties.

6151* (German.) Formation of High Polymers by the Incorporation of Metals Into Polymeric, Oil-Containing, Film Forming Materials and Different Synthetic Resins. **Ausbildung von Hochpolymeren durch Metallverstärkung von polymeren ölhaltigen Filmbildnern und von verschiedenartigen Kunstharzen.** Felix Schlenker. *Kunststoffe*, v. 47, Jan. 1957, p. 7-14.

A review is given of results obtained to date, with special reference to varnish raw materials.

6152* (German.) The Investigation of Flow Properties of Molding Materials. **Zur prüfung des Fliessverhaltens von Kunststoff-Formmassen.** C. M. Frhr. v. Meysenbug. *Kunststoffe*, v. 47, Jan. 1957, p. 14-17.

Characteristic curves illustrate the behavior of various types of plastics.

6153* (German.) Polyacrylic Hydrazides. **Über Hydrazide von Polyacrylsäuren. I.** Preparation and Properties of Polyacrylic Acid Hydrazides. **Darstellung und Eigneschaften der Polyacrylsäurehydrazide. II.** Preparation and Properties of Polyacrylic Acid Hydrazones. **Darstellung und Eigenschaften von Polyacrylsäurehydrazonen.** W. Kern, Th. Hucke, R. Holländer, and R. Schneider. *Makromolekulare Chemie*, v. 22, nos. 1-2, 1957, p. 31-46.

6154* (German.) Certain Fractionations of High-Pressure Polyethylenes. **Über einige Fraktionierungen von Hochdruckpolyäthylenen.** A. Nasini and C. Mussa. *Makromolekulare Chemie*, v. 22, nos. 1-2, 1957, p. 59-80.

To estimate the influence of the crystallinity on the fractionation, four high-pressure polyethylenes of different average degree of polymerization were fractionated by three different methods.

6155* (English.) **Citrate and Oxalate Radical-Ion Initiated Vinyl Polymerization in Aqueous Solution.** R. V. Subramanian and M. Santappa. *Makromolekulare Chemie*, v. 22, nos. 1-2, 1957, p. 147-162.

Kinetics of polymerization reactions was followed by studying the dependence of monomer disappearance, ferrous ion production, and chain lengths of polymers on the monomer concentration, light intensity, and light absorption fraction of the ion-pairs.

6156 Radiotracer Studies of PVA. I. H. K. Inskip and J. H. Peterson. *Modern Packaging*, v. 30, Jan. 1957, p. 137-140.

Tests on polyvinyl alcohol in packaging applications show that the polymer is not significantly solvent in edible fats and oils of low water content.

6157 Shrinkage of Thermosets. A. J. Guzzetti. *Modern Plastics*, v. 34, Feb. 1957, p. 111 + 9 pages.

Shrinkage mechanisms; molding factors; mold and piece design variables; material factors.

6158 High-Shear-Rate Rheological Properties of Plastics. Arnold C. Werner. *Modern Plastics*, v. 34, Feb. 1957, p. 137 + 6 pages.

Operation of the Severs extrusion rheometer; mathematical basis for the calculations. Methods of plotting flow curves and interpretation of data. Evaluations of various plastisol resins, plasticizers, and fillers.

6159 Environmental Stress Cracking of Ethylene Plastics. Kenneth A. Kaufmann. *Modern Plastics*, v. 34, Feb. 1957, p. 146, 148, 232.

Apparatus and procedure for a proposed test involving exposing bent specimens of the plastic having a controlled imperfection on one surface to the action of a surface active agent.

6160 Penton—A New Chlorine-Containing Polymer. E. W. Cronin. *Modern Plastics*, v. 34, Feb. 1957, p. 150 + 4 pages.

This chlorinated polyether combines extremely close-tolerance molding characteristics with a high degree of dimensional stability, good chemical resistance, and excellent physical and electrical properties.

6161* (German.) Flow Conditions and the Deformation Law of Viscous Plastics. **Die Fliessbedingung und das Verformungsgesetz viskoser plasticher Stoffe.** P. R. Paslay and A. Slibar. *Österreichisches Ingenieur-Archiv*, v. 10, no. 4, 1956, p. 328-344.

Study of three-dimensional flow and determination of a tri-axial deformation law. Application to a thrust bearing with a grease lubrication.

6162 Optical Absorption in Liquid Sulphur-Selenium Copolymers. R. A. Hyman. *Physical Society, Proceedings*, v. 69, no. 443B, Nov. 1956, p. 1085-1088.

Temperature dependence of the absorption edge is -1.8×10^{-3} e.v. per degree C in Se and copolymers containing up to 84 at.% S, and -2.9×10^{-2} e.v. per degree in S.

6163* Polyester Resin Evaluation With Short-Time Flexural Creep Tests. A. D. Coggeshall. *Plastics Technology*, v. 3, Jan. 1957, p. 35-44.

Details of a rapid, simple test which measures plasticity of a reinforced plastics laminate as a function of temperature and stress.

6164* Stability of Nylon Parts in Business Machines. Byron W. Nelson. *SPE Journal*, v. 13, Feb. 1957, p. 13-16, 64.

Wear of nylon in contact with other materials; surface finish requirements for mating steel parts in moving contact with nylon; effect of relative humidity on dimensions of nylon parts.

6165* Valved Extrusion. Ernest C. Bernhardt. *SPE Journal*, v. 13, Feb. 1957, p. 17-22.

Types of valves for controlling flow of polymers from extruders; design considerations; interrupted extrusion.

6166* The Effect of Carbon Black on the Stability of Polyethylene. John T. Moynihan. *SPE Journal*, v. 13, Feb. 1957, p. 23-26, 62.

Carbon black dispersed in polyethylene resin is effective in preventing degradation due to light and weathering. Mechanisms of preservation depend to a great extent on the degree of dispersion.

6167* Bulk Compressibility of Polymers at Fabricating Temperatures. B. Maxwell and S. Matsuoka. *SPE Journal*, v. 13, Feb. 1957, p. 27-32.

Polymer melts are highly compressible. Compressibility varies with material, is always non-linear, and depends on the rate of compression.

6168* Development of Plastic Pipe Standards. H. W. Kuhlmann. *SPE Journal*, v. 13, Feb. 1957, p. 33, 36.

The long-time stress-rupture test is the only reliable one known for determining the long-time serviceability of extruded plastic pipe. The present status of standards currently under study is outlined.

6169 (German.) Determination of Thermal Conductivity in Plastics. **Zur Ermitlung von Wärmeleitzahlen von Kunststoffen.** O. Nehring. *Technik*, v. 11, Dec. 1956, p. 821-824.

Determination of thermal conductivity of large-dimension PVC samples using the Weis instrument.

6170* How to Machine Plastics. III. Secondary Operations. Robert A. Wason. *Tool Engineer*, v. 38, Feb. 1957, p. 117-126.

Specific information on milling, drilling, tapping, threading, planing, shaping, routing, and broaching. Speeds, feeds, and tool geometrics are altered to take into account different properties.

6171 Some Vital Roles of Plastics in High-Energy Nuclear Research. James O. Turner. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3440, Oct. 1956, 43 p. (UF767 U3u Contin.)

6172 Copolymers of Olefin Sulfides. O. C. Dermer. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 55-447, June 1956, 45 p. (TL507 Un3.18w Vis.)

Preparation and properties of simple copolymers; polymerization of 1,3-oxathiolane and related compounds; kinetics of copolymerization.

See also: **5114** (interaction of drugs with polymers); **5190** (poly-soap solutions); **5269** (light-scattering studies); **5349** (silicones in electrical appliances); **5422** (embedment compounds); **5449** (irradiation of cellophane); **6015** (plastics for protection against radiation); **6118** (rheology studies); **6188** (properties of high polymers); **6220** (polymer fibers); **6224** (plastic coated paper).

POLLUTION AND WASTES

6173* Optimum Particle Size for Penetration Through the Millipore Filter. Joseph J. Fitzgerald and Charles G. Detwiler. *Archives of Industrial Health*, v. 15, Jan. 1957, p. 3-8.

Particle collection efficiency depends on particle size and varies with face velocity in the face-velocity range of 10 to 40 cm. per sec. There is an optimum particle size for total penetration. Particle collection efficiency depends on particle size and varies with face velocity in the face-velocity range of 10 to 40 cm. per sec. There is an optimum particle size for total penetration.

6174 Foundry Air Pollution Control Manual. 58 p. 1956. American Foundrymen's Society, Des Plaines, Illinois. (TD884 Am35f Over.)

Engineering characteristics of various types of equipment; typical operating data; air pollution ordinances; community relations.

6175 (Swedish.) Planning Foundry Ventilation. **Planering av gjuteriventilationen.** Karl Nilsson. *Gjuteriet*, v. 46, Dec. 1956, p. 161-163.

6176 Methylstyrene—A Case Study in Spent Acid Catalyst Treatment. Nathan Federgreen and Arthur J. Weinberger. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 46-48.

By hydrolyzing and stripping Hg and sulfuric acid wastes with superheated steam, Hg and toluene may be recovered in high yield, and the stripped sulfuric acid is sufficiently concentrated to be used in fertilizer manufacture.

6177 Biological Oxidation of Some Organic Compounds. Richard Hatfield. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 192-196.

Of 23 compounds frequently found in organic wastes, primary and secondary alcohols and aldehydes are readily oxidized, but tertiary alcohols, methylal, and glycols are resistant.

6178 Practical Aspects of Electrostatic Precipitator Operation—Experiments on a Pilot Plant. A. Little. *Institution of Chemical Engineers, Transactions*, v. 34, no. 4, 1956, p. 259-268.

The dust collecting efficiency of a pilot precipitator treating flue gas from a large pulverized-fuel-fired boiler was measured for various conditions of operation, including various gas velocities, rapping cycles, and current densities.

6179* Washery Water Clarification to Prevent Stream Pollution. Mathew Turkovich. *Mining Congress Journal*, v. 43, Jan. 1957, p. 46-49.

Fine coal plant was designed and constructed to operate with a two-stage cyclone system followed by filtration to recover the maximum quantity of fine coal as a salable product. Plant waste has consistently contained less than 1% solids.

6180* Current Research Findings on Radioactive Fallout. Willard F. Libby. *National Academy of Sciences of the United States of America, Proceedings*, v. 42, Dec. 1956, p. 945-962.

Types of fallout. Amount of fallout and expected Sr-90 body burden from weapons fired to date; effect of rainfall; direct measurement of the stratospheric fallout content; radiocesium assays for the biosphere.

6181* Experiences With the Austin, Texas "Biosorption" Plant. A. H. Ullrich. *Water & Sewage Works*, v. 104, Jan. 1957, p. 23-31.

Successful conversion of a large plant to the process whereby activated sludge and raw sewage are mixed, the mixture settled, and overflow discharge from the settling tank as final effluent.

6182* Intermittent Sand Filters and Their Biology. Wilson T. Calaway. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 1-5.

Biological oxidation is the most important action in sewage purification by this method. Bacteria are the primary agents in the destruction of organic substances.

6183* Three Tracer Methods for Determining Detention Times in Primary Clarifiers. Homer Ambrose, Jr., E. Robert Baumann, and Eric B. Fowler. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 24-33.

Salt, fluorescein dye, and radioisotope tracer methods.

6184* Treatment of Plating Wastes From Computer Manufacturing. L. J. Hosman and R. J. Keating. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 34-44.

Chemical engineering factors involved in the treating of cyanide and Cr plating wastes by ion exchange methods.

6185* Metal-Finishing and Brass Mill Wastes. Merwin E. Hupfer. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 45-52.

Types and sources of wastes; methods of treatment and recovery; toxicity to aquatic life; effect on sewage systems.

6186* Cooperative State-Industry Stream Studies—Lower Fox River, Wisconsin. A. J. Wiley, B. F. Lueck, Ralph H. Scott, and T. F. Wisniewski. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 76-87.

6187* Trickling Filters and Operation Tips. George T. Lohmeyer. *Sewage and Industrial Wastes*, v. 29, Jan. 1957, p. 89-98.

Filter theory; structure and operation; standard-rate and high-rate trickling filters; problems and solutions; miscellaneous operating details.

See also: **5056** (analysis of sewage); **5566** (treatment of coking-plant wastes); **6002** (radioactivity monitor for streams); **6319** (waste disposal problems).

RUBBER AND ELASTOMERS

6188 (German.) Contributions to the Technology of High Polymers. Rubber and Plastics. **Beiträge zur Technologie der Hochpolymeren. Gummi und Kunststoffe.** Wilhelm Späth. 280 p. 1956. A. W. Gentner, Stuttgart. (TP986.A2 Sp12b)

Behavior and properties of high polymers are compared with those of other materials, especially metals. Internal friction is compared with external friction. Production of supersonic vibrations and short but very high heating reactions. Test methods. The behavior of high polymers during tensile and fatigue tests and the development of various characteristics at different temperatures.

6189 Sulfur Vulcanization of Vinyl-Substituted Polysiloxanes. Keith E. Polmanteer and Robert J. Koch. *Industrial and Engineering Chemistry*, v. 49, Jan. 1957, p. 49-54.

Introducing olefinic side groups in place of some alkyl side groups renders the polysiloxane susceptible to sulfur vulcanization. Effect of substitution is discussed.

6190* Behaviour of "Pure Gum" Rubber Vulcanisates in Tension. G. M. Martin, F. L. Roth, and R. D. Stiehler. *Institution of the Rubber Industry, Transactions*, v. 32, Dec. 1956, p. 189-203.

Measurements on Hevea, GR-S, GR-I, and Neoprene rubbers between 25 and 55 C showed that elongations in most cases increased approximately linearly with the logarithm of time. Stress-strain curves were similar for all up to 200% elongation.

6191* (German.) Measuring the Electric Conductivity of Rubber. General Specifications and Fundamental Experiment in the Measuring Technique. **Messung der elektrischen Leitfähigkeit von Gummi. Normvorschriften und grundlegende Erfahrungen zur Messtechnik.** D. Zernial. *Kautschuk und Gummi*, v. 10, Jan. 1957, p. WT1-WT5.

Study of the problem of producing a uniform conductivity inside the specimen by sufficient homogenization of the rubber mixture.

6192* (German.) On the Direct Reinforcement of Latex. **Über die direkte Verstärkung von Latex.** Jean LeBras. *Kautschuk und Gummi*, v. 10, Jan. 1957, p. WT6-WT13.

A study of latex reinforcement by addition of rosins, especially resorcinol-formaldehyde-rosin, and a comparison of vulcanized products obtained by this method with rubbers reinforced with carbon black.

6193 O-Rings and Interference Seals for Static Applications. James B. Morrison. *Machine Design*, v. 29, Feb. 7, 1957, p. 91-94.

A mathematical analysis giving recommended design formulas.

6194 Manual of Reclaimed Rubber. J. M. Ball, editor. 94 p. 1956. Rubber Reclaimers Assn., New York. (TS1892 B21m)

Technical data including properties and advantages of reclaimed rubber and principles of compounding it. Formulations for various commercial uses.

6195 The Chemistry of Reinforcement. I. Some Reactions Between Carbon Black and Simple Inorganic Molecules. Merton L. Studebaker. *Rubber Age*, v. 80, Jan. 1957, p. 661-671.

In their chemical reactions, carbon blacks resemble polycyclic aromatic hydrocarbons which have been oxidized to various degrees.

6196* The Polymerization of Vinyl Monomers in Natural-Rubber Latex. George F. Bloomfield and P. McL. Swift. *Rubber Chemistry and Technology*, v. 29, Oct.-Dec. 1956, p. 1119-1126.

Practical methods for polymerizing methacrylic esters, styrene, and other vinyl monomers in natural-rubber latex.

6197* Tire Wear and Fuel Consumption. H. C. J. de Decker, G. J. Van Amerongen, and J. F. Benders. *Rubber Chemistry and Technology*, v. 29, Oct.-Dec. 1956, p. 1445-1457. (From *Kautschuk und Gummi*, v. 8, Sept. 1955, p. 21-26.)

Measurements show that GR-S tires are advantageous only in a tropical climate. In all other countries natural-rubber tires are more economical.

6198 Conductive Rubber. Its Production, Application and Test Methods. R. H. Norman. *Rubber Journal*, v. 131, Dec. 29, 1956, p. 895-896, 898; v. 132, Jan. 5, 1957, p. 19-24; Jan. 12, 1957, p. 43 + 4 pages; Jan. 19, 1957, p. 84-86, 88.

Effects of mastication, carbon black type and concentration, and other factors on resistivity. (To be continued.)

6199 Extrusion of Natural and Synthetic Rubbers. E. H. Hurlston. *Rubber and Plastics Age*, v. 38, Jan. 1957, p. 50-55.

6200* (Russian.) Selective Sorption of Binary Solutions by Rubbery High Polymers. **Izbiratel'naia sorbtsiia binarnykh rastvorov kauchukopodobnymi vysokopolimerami.** G. L. Starobinets. *Uspekhi Khimii*, v. 25, Dec. 1956, p. 1502-1517.

Critical survey of experimental data, the thermodynamic properties of solutions, and theoretical determination of selective sorption.

See also: **5050** (determination of rubber antioxidants); **5492** (growth trends in rubber industry); **6166** (carbon-black dispersions in polyethylene).

SPACE HEATING AND CONDITIONING

6201 Calculating the Heat Requirements of a Snow Melting System. VI. Northeast Region. William P. Chapman. *Air Conditioning, Heating, and Ventilating*, v. 54, Feb. 1957, p. 101-105.

Covers the states of New York, Vermont, New Hampshire, and Maine.

6202* Current Refrigeration Problems of Interest to the Citrus Industry. Daniel C. McCoy. *Food Technology*, v. 11, Jan. 1957, p. 23-27.

Hydro-cooling combined with mechanically refrigerated railroad cars and mechanically refrigerated trucks deserve attention in future planning. Low temperature refrigeration and the handling of frozen foods in the retail store need improvement.

6203* The Hidden Bonus in 1957 New Home Construction: 200,000 Additional Comfort Zones. C. W. Nessell. *Heating & Air Conditioning Contractor*, v. 48, Jan. 1957, p. 46-51.

One out of five new homes will require two or more thermostats to provide indoorcomfort.

6204* Room Air Distribution: From Floor, Baseboard and Low Sidewall Outlets During Cooling. Harold E. Straub. *Heating & Air Conditioning Contractor*, v. 48, Jan. 1957, p. 52-57.

Factors which determine how well the various types of perimeter diffusers work on cooling.

6205* The Behaviour and Performance of a Triple-Fluid, Vapour Absorption Refrigerator. III. F. G. Watts and C. K. Gulland. *Modern Refrigeration*, v. 60, Jan. 1957, p. 30-33.

6206* Dielectric Properties of Refrigerants. Their Effect on Motor Insulation Resistance. E. A. Beacham and R. T. Divers. *Modern Refrigeration*, v. 60, Jan. 1957, p. 39-42.

Measurements on operating equipment made over a period of yrs. The results are interpreted with the aid of the known dielectric properties of the most commonly used refrigerants, both in their pure state and when contaminated with water and oil.

6207* How we Design a High-Temperature Water System. P. L. Geiringer and B. M. Venable. *Power*, v. 101, Feb. 1957, p. 77-79, 202, 204.

Operating characteristics and design details.

6208* How Power Usage Varies for Summer Air Conditioning of Identical Homes. R. A. Gonzalez. *Refrigerating Engineering*, v. 65, Jan. 1957, p. 35-40.

Research involving similar houses shows wide variations in power consumption for air conditioning purposes, even when differences of heat gain and equipment performances are reduced to the minimum.

6209* Unique 700-Ton Heat Pump Installation. J. J. Floreth. *Refrigerating Engineering*, v. 65, Jan. 1957, p. 45-48.

Some facts about heating and air conditioning system of huge 3-story, 70-store shopping center structure.

6210 Humidity Controls for Conditioning Rooms. T. C. Scheffer. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 2048, Jan. 1956, 9 p. (TS800 Un3.3r Contin.)

Apparatus for small rooms; tension-type hygrostats for large rooms.

6211 Year-Round Residential Air Conditioning. 61 p. 1956. American Society of Heating and Air-Conditioning Engineers, New York. (TH7687 Am35y Over.)

A symposium dealing with new concepts of comfort cooling, equipment and operation of all-year systems, and future electronic, solar, and nuclear developments.

See also: **5424** (cooling of electronic equipment); **5557** (flues for gas appliances).

TEXTILES, FIBERS, LEATHER, AND PAPER

6212 A Non-Random Disaggregation of Intact Skin Collagen. Arthur Veis and Jerome Cohen. *American Chemical Society, Journal*, v. 78, Dec. 20, 1956, p. 6238-6244.

Studies show the presence of lateral polypeptide chain cross-linkages of different reactivity and, probably, different distribution along the fibrillar long axis. There appear to be two classes of such cross-linkages and the order in which these are broken determines the mol. wt. distribution of the solubilized portion.

6213* Cationic Softeners—Their Secondary Effects on Textile Fabrics. *American Dyestuff Reporter*, v. 46, Jan. 28, 1957, p. P41-P57, P64.

Results of tests with nine cationic softeners applied to Acrilan, Arnel, cotton, nylon, rayon, and wool.

6214* Applications of Sonic Techniques in the Textile Industry. Miguel G. Junger. *American Dyestuff Reporter,* v. 46, Jan. 28, 1957, p. P58-P59.

Use in dyeing and cleaning. Economic considerations.

6215* New Developments in Tanning With Aldehydes. L. Seligsberger and C. Sadlier. *American Leather Chemists Association, Journal,* v. 52, Jan. 1957, p. 2-16.

A comprehensive study of the tanning action of aliphatic dialdehydes with straight C-C chains. Glyoxal showed the best tanning properties.

6216* Tanning Studies With Aldehydes. M. L. Fein and E. M. Filachione. *American Leather Chemists Association, Journal,* v. 52, Jan. 1957, p. 17-23.

Calfskin and cattle hide which had been processed through the conventional pretanning operations were treated with eight different aldehydes and the tanning action observed.

6217* Calculation of Stretch From Ball Bursting Strength Data. I. D. Clarke and E. H. Harris. *American Leather Chemists Association, Journal,* v. 52, Jan. 1957, p. 24-30.

Methods for calculating elongation of the diameter of a circular leather test specimen, and increase in area of the specimen, from data obtained in the ball burst test.

6218* Penetration of Wattle Tannins Into Hide as Examined by Chromatographic and Molecular Weight Methods. D. G. Roux and S. R. Evelyn. *American Leather Chemists Association, Journal,* v. 52, Feb. 1957, p. 58-66.

There appears to be a direct relationship between affinity for cellulose (and collagen) and mol. wt. of black wattle tannins.

6219 Applications of Infrared Spectroscopy to Textile Problems. C. G. Cannon. *Chemistry & Industry,* no. 2, Jan. 12, 1957, p. 29-33.

Techniques; study of inter-molecular forces; general applications.

6220* The Search for and Production of New Fibres. I. Polyamide, Polyester and Acetate Fibres. A. J. Hall. *Fibres, Engineering and Chemistry,* v. 18, Jan. 1957, p. 5-8.

Problems, preparation, and properties.

6221* "Acrilan"—Acrylic Fibre Technology. John B. Miles and S. Jack Davis. *Fibres, Engineering and Chemistry,* v. 18, Jan. 1957, p. 9-12, 25.

Composition, properties, and textile processing.

6222* Keeping Fabrics Clean. II. Modern Practice in the Dry Cleaning Industry. H. Sieber. *Fibres, Engineering and Chemistry,* v. 18, Jan. 1957, p. 13-15, 25.

Non-flammable solvents; spotting and finishing procedures.

6223* Distribution of Fungicidal Extractives (Thujaplicin and Water-Soluble Phenols) in Western Red Cedar Heartwood. H. MacLean and J. A. F. Gardner. *Forest Products* Journal, v. 6, Dec. 1956, p. 510-516.

Analyses for natural preservative content by chemical methods established a general pattern of increasing content with increasing radial distance from the pith and decreasing content with increasing distance up the tree.

6224* (German.) Manufacture of Plastic Coated Packaging Papers. **Herstellung Kunststoff-Beschichteter Verpackungspapiere.** Gustav Hagen. *Kunststoffe,* v. 47, Jan. 1957, p. 2-6.

Properties, mode of application, advantages, and disadvantages. Plastic and paraffin mixtures.

6225* Resins and Replacement Materials. Frank Edmonds. *Leather and Shoes,* v. 133, Jan. 19, 1957, p. 15-18.

Advantages and problems of using amino type resins for tanning and retanning leather.

6226* An Effective New Anti-Static Finish. Giuliana C. Tesoro. *Modern Textiles Magazine,* v. 38, Jan. 1957, p. 47-48.

"Aston LT" is effective in small amounts on all fibers and is permanent to washing and dry cleaning.

6227 The Orientation of the Structure of 6.6 Nylon Fibres. M. F. Culpin and K. W. Kemp. *Physical Society, Proceedings,* v. 69, no. 444B, Dec. 1956, p. 1301-1308.

The optical and X-ray diffraction properties of a model fiber were considered. The fiber is assumed to consist of an assemblage of structural units.

6228* Sulphidity as a Variable in the Pulping of Western Red Cedar: The Effect of the Na_2S Wood Ratio on Pulp Properties. C. B. Christiansen, J. S. Hart, and J. H. Ross. *Pulp and Paper Magazine of Canada,* v. 58, Jan. 1957, p. 103-109.

6229* The Limits on Output From a Sulphite Digester. Frank Dickson. *Pulp and Paper Magazine of Canada,* v. 58, Jan. 1957, p. 110-112.

Miniature digester studies indicate a maximum yield of 60 to 65% for newsprint furnish. Safe maximum degree of chip packing is 40%. Minimum cooking time is 4 to 4½ hr.

6230* Fibre Length Index as a Measure of Pulp Quality During Stock Preparation: Laboratory Studies With P. Radiata Sulphate Pulps. N. J. Buckland and C. J. Mathieson. *Pulp and Paper Magazine of Canada,* v. 58, Jan. 1957, p. 113-120.

6231* The Use of Our Forests. Douglas W. Ambridge. *Pulp and Paper Magazine of Canada,* v. 58, Jan. 1957, p. 131, 133-134, 136.

What the well-informed public should know about their forests.

6232* The Influence of Syntans on the Tanning Process. W. S. Short. *Society of Leather Trades' Chemists, Journal,* v. 40, Dec. 1956, p. 381-401.

6233* The Action of Water on Cellulose Between 100 and 225°C. B. B. Mithel, G. H. Webster, and W. H. Rapson. *Tappi,* v. 40, Jan. 1957, p. 1-4.

Effect of water is determined by the pH and by the amount of buffering material present to prevent or retard the pH drop.

6234* High-Yield Neutral Sulphite Pulps. Giorgio Ceragioli, E. L. Keller, and G. H. Chidester. *Tappi,* v. 40, Jan. 1957, p. 8-14.

Data on pulps from aspen, white oak, and jack pine. As the yield proceeded to low values, brighter pulps were obtained that required less Cl for bleaching. Opacity also improved.

6235* Reactivity of Cellulose Toward Acetylation. Elizabeth Dyer and Harry D. Williams. *Tappi,* v. 40, Jan. 1957, p. 14-20.

Reactivity determination consists in measuring rate of temperature rise during perchloric acid-catalyzed acetylation of water-pretreated cellulose in the presence of 2,2'-dichlorodiethyl ether as a diluent. Pretreatment of cellulose with polar liquids such as dimethylformamide was as effective as water in increasing reactivity.

6236 The Effect of Pulpwood Aging on Groundwood Brightness. Frank A. Whitman. *Tappi,* v. 40, Jan. 1957, p. 20-24.

Bleached groundwood of 70 brightness was obtained by bleaching freshly cut wood with 1.0% sodium peroxide or zinc hydrosulphite, but wood aged for 12 months required a substantial increase in bleaching chemicals to obtain the same results.

6237* Molecular Properties of Seven Native Wood Celluloses. T. E. Timell. *Tappi,* v. 40, Jan. 1957, p. 25-29.

Nitration of wood resulted in isolation of nitrated celluloses with a minimum of depolymerization.

6238* Nitration as a Means of Isolating the Alpha-Cellulose Component of Wood. T. E. Timell. *Tappi,* v. 40, Jan. 1957, p. 30-33.

Method was found effective for both deciduous and coniferous woods.

6239* A Fundamental Study of the Softening Mechanism of Paper Plasticizers. Philip E. Nethercut. *Tappi,* v. 40, Jan. 1957, p. 39-45.

6240* Tracing Defects With the Uster Evenness Tester. Ernest R. Beckner. *Textile Industries,* v. 121, Feb. 1957, p. 139-141.

6241 Single-Thread Breaking Load and the Winding Test. H. P. Stout and F. Stern. *Textile Institute, Journal (Transactions),* v. 47, Dec. 1956, p. T621-T634.

For any specific type of yarn, a consistent empirical relationship exists between single-thread breaking-load test results and breakages in the winding test. Thus, breakage frequency may be predicted at any winding tension.

6242* Microscopical Observations on Partially Acetylated Cottons and Related Fibers. Verne W. Tripp, Ruth Giuffria, and Ines V. deGruy. *Textile Research Journal*, v. 27, Jan. 1957, p. 14-24.

Cross-sectional area of partially acetylated fibers increases with degree of substitution. Average refractive index decreases with increase in acetyl content. Acetylation causes the surface of cotton to become smoother, and obliterates the microfibrillate pattern characteristic of scoured fibers.

6243 Hardwood-Distillation Industry. Edward Beglinger. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 738, Feb. 1956, 22 p. (TS800 Un3.3r Contin.)

Products and uses; commercial distillation methods.

6244 Standard Terms for Describing Wood. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1169, Feb. 1956, 12 p. (TS800 Un3.3r Contin.)

Tables show properties of U. S. woods as represented by comparative figures and descriptive terms.

6245 Bearing Strength of Wood at Angle to the Grain. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1203, Mar. 1956, 3 p. (TS800 Un3.3r Contin.)

Nomograph enables determination of stress or load for any intervening angle from the stress or load parallel and perpendicular to the grain.

6246 Comparison of Wood Preservatives in Stake Tests. J. Oscar Blew. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1761, Mar. 1956, 49 p. (TS800 Un3.3r Contin.)

Tabulated test data for various preservatives on southern yellow pine sapwood.

6247* Stress Quality Control in Receiving Inspection. L. O. Reed and R. T. White. *Wood and Wood Products*, v. 62, Feb. 1957, p. 44, 46, 72.

Statistical sampling is deemed an accurate, efficient, and economical way to detect defects in incoming stock.

6248 Groundwood and Sulfate Pulping and Newsprint Papermaking Experiments on Engelmann Spruce. E. R. Schafer, J. C. Pew, A. Hyttinen, J. S. Martin, and R. M. Kingsbury. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1407, May 1956, 13 p. (TS800 Un3.3r Contin.)

A newsprint paper well above average in strength and brightness can be made from groundwood and semibleached sulfate pulps produced from this species.

See also: **4995** (chemicals from pulping wastes); **5111** (structure of anthraquinone dyes); **5203** (spectra of Cr complexes); **5730** (strength of plywood); **6140** (cellulosic fibers); **6210** (decay-resistance testing of wood).

WELDING AND JOINING

6249* Welding of Steel With Consumable Electrodes Under a Shield of Carbon Dioxide (Shielded Carbon-Arc Welding of Steel). E. Sellier. *Acier, Stahl, Steel*, v. 21, Dec. 1956, p. 489-492.

Tensile strength and resilience were determined on specimens of open-hearth and basic-bessemer steels welded with two types of electrodes.

6250 Resistance Welding. Recent Advances in Application to Airframe Construction. N. K. Gardner. *Aircraft Production*, v. 19, Feb. 1957, p. 63-71.

6251* (Spanish.) Welding Copper Cables. **Estudio de la union de cables de cobre por medio de la soldadura.** Oleh Zabara. *Ciencia y Técnica de la Soldadura*, v. 6, Sept.-Oct. 1956, 3 p.

Argon shielded arc welding procedures. Measures to prevent changes in conductivity and corrosion resistance.

6252 Joint Design for Making Root Pass Welds Without Filler Material. L. C. Lemon and W. R. Smith. *Hanford Atomic Products Operations (U. S. Atomic Energy Commission)*, HW-44245, July 1956, 15 p. (UF767 Un3.1hw Contin.)

6253* (Finnish.) The Qualities of Welding Electrodes. **Hitsauspuikkolaadut.** O. Tuovinen. *Hitsaustekniikka Svetsteknik*, no. 6, Nov. 1956, p. 137-140, 142, 144.

The effects of the electrode coating on the welding process were studied and the various welding electrodes were classified according to their coating types. Economical use of electrodes.

6254* (Finnish.) Influence of the Arc Length on the Electrode Melting Time and the Quality of the Weld. **Metallikaaren pituuden vaikutus puikon sulamisaikaan ja hitsin laatuun.** Niils Ojanperä. *Hitsaustekniikka Svetsteknik*, no. 6, Nov. 1956, p. 146-147.

A study tending to prove that welding with an arc as short as possible gives best results.

6255* (Finnish.) The Gas Welding of Thin Plates. **Ohutlevyn kaasuhitsaus.** P. Blomqvist. *Hitsaustekniikka Svetsteknik*, no. 6, Nov. 1956, p. 156-158.

Description of a non-pressure welding process for thin plates of steel and non-ferrous metals.

6256* Complete Inert Gas Shield is Key to Successful Zirconium Welding. G. E. Elder, E. C. Miller, L. F. Bledsoe, and F. V. Daly. *Industry & Welding*, v. 30, Feb. 1957, p. 52 + 8 pages.

Two operators worked together during welding of reactor core tank. One fed filler wire, maintained electrode position, and operated welding current contactor; other maintained proper arc voltage, controlled welding current, and operated stop and start controls.

6257* Weld Stainless With Submerged Arc. W. E. McFee. *Industry & Welding*, v. 30, Feb. 1957, p. 64-66, 89.

6258* Gouging Castings With Carbon Arc Speeds Preparation for Welding. Ted Roberts. *Industry & Welding*, v. 30, Feb. 1957, p. 82-84, 86.

Application to massive welding in hydro-power plants.

6259 How Heat and Time Affect Welding. A. C. Ward. *Iron Age*, v. 179, Jan. 17, 1957, p. 75-77.

Changes in structure and mechanical properties.

6260 How to Avoid Problems With Damp Electrodes. A. C. Ward. *Iron Age*, v. 179, Feb. 7, 1957, p. 108-110.

6261 (English and Spanish.) **Stud Welding. Its Use in the Oil and Chemical Industries.** E. F. Robinson. *Machinery Lloyd (Overseas Ed.)*, v. 29, Jan. 5, 1957, p. 89-92.

Some advantages and applications.

6262* (French.) Submerged Arc Welding. **Le soudage à l'arc submergé.** A. Moreau. *Revue de la Soudure (Brussels)*, v. 12, no. 4, 1956, p. 197-205.

Description of process. Theoretical explanation of the passage of electricity through the flux.

6263* (French.) Remarks on the "Free Flowing Temperature" in Silver Brazing. **Quelques notes au sujet de la température de travail des brasures à l'argent.** D. Loebich. *Revue de la Soudure (Brussels)*, v. 12, no. 4, 1956, p. 206-208.

A study of the "interval of fusion" of the two fusion points in Ag brazing. The free flowing temperature is defined and a method to determine it is discussed.

6264* (French.) Methods Recommended in Resistance Welding. **Pratiques recommandées pour le soudage électrique par résistance.** M. Klopfert. *Revue de la Soudure (Brussels)*, v. 12, no. 4, 1956, p. 243-258.

Spot and butt welding techniques; determination of defects in welds.

6265* (French.) Recommended Welds in Mounting Connectors on Pressure Containers. **Les dispositions soudées recommandées pour fixation d'organes connexes sur les récipients à pression.** *Soudage et Techniques Connexes*, v. 10, Nov.-Dec. 1956, p. 320-330.

A series of drawings with commentaries concerning various joining methods, such as threaded joints, screwed connections, bolt connections, flanges, etc., considering in each case the possibility of welding on both sides of the wall or on one side only.

6266 A Metallurgist Looks at Flash Welding. Hiram Brown. *Steel*, v. 140, Jan. 28, 1957, p. 90-91.

Metallurgical tests at the right time and place can clear up many problems in flash butt welding.

6267* (Russian.) Building Up Worn Machine-Part Surfaces by Vibrating Contact Welding. **Vosstanovlenie iznoshennykh poverkhnostei detalei vibrokontaktnym narashchivaniem.** V. V. Efremov and V. G. Gevorkian. *Vestnik Mashinostroeniia*, v. 36, Dec. 1956, p. 65-68.

Principles, methods of construction, and operation of a machine for building up worn surfaces. A turning, vibrating welding electrode deposits metal which is immediately cooled by a liquid. A 2-mm. layer of metal can be built up. The thermal effects of the process penetrate only about 0.1 to 0.2 mm. into the metal of the part being repaired.

6268 Filler Metals for Joining. Orville T. Barnett. *Welding Engineer*, v. 42, Feb. 1957, p. 38-40.

Composition, properties, and uses of high-tensile and low-alloy electrodes.

6269 Welding Precipitation-Hardening Stainless Steels. George E. Linnert. *Welding Journal*, v. 36, Jan. 1957, p. 9-27.

Metallurgical structure of the four major types; details on their weldability, heat treatment, and welding procedures.

6270 Argon-Hydrogen Shielding-Gas Mixtures for Tungsten-Arc Welding. T. McElrath and E. F. Gorman. *Welding Journal*, v. 36, Jan. 1957, p. 28-35.

Use of the mixtures results in substantial cost savings and other tangible benefits such as smooth, clean welds, a more fluid puddle, longer electrode life, and faster weld speeds than can be achieved with A or He.

6271 Coating Ingredients' Influence on Surface Tension, Arc Stability and Bead Shape. T. H. Hazlett. *Welding Journal*, v. 36, Jan. 1957, p. 18S-22S.

6272 Metal Transfer Characteristics in Gas-Shielded Arc Welding. H. C. Ludwig. *Welding Journal*, v. 36, Jan. 1957, p. 23S-26S.

The kinematics of single bodies of transferring arc metal; the major factors governing their projection from the electrode to the work.

6273 Properties of Austenitic Chromium-Manganese Stainless-Steel Weld Metal. W. T. DeLong and H. F. Reid, Jr. *Welding Journal*, v. 36, Jan. 1957, p. 41S-48S.

These alloys combine very high strength with reasonable ductility high crack resistance in a restrained joint with a completely nonmagnetic structure.

6274 A Constant Potential Power Source for the Self-Adjusting Arc Welding of Aluminium and Its Alloys. J. G. Young. *Welding and Metal Fabrication*, v. 25, Jan. 1957, p. 6-8.

6275* Soldering Fluxes and Flux Principles. A. Z. Mample. *Western Union Technical Review*, v. 11, Jan. 1957, p. 35-42.

Thermal and mechanical considerations; flux corrosion; flux conductivity; thermal vs. production factors for electric circuits.

6276* (German.) Studies of Welded Joints. **Über Untersuchungen an Schweissverbindungen.** Hans Stäger. *Zeitschrift für Schweisstechnik*, v. 46, Dec. 1956, p. 288-295.

Tests on welded joints made with new fine-grained steel sheet, "BH 58 KA". Use of the new "Tensilend" welding electrode. Automatic submerged-arc welding with the "Utilax" electrode.

See also: **5352** (soldering of electrical printed circuits); **5847** (cracks in welded and riveted steel plates); **5848** (cracking of steel welds); **5891** (brittle fracture of welds).

MISCELLANEOUS

6277 Russia's "Automatic Factory". Peter Trippe. *American Machinist*, v. 101, Jan. 14, 1957, p. 147-154.

A detailed report on the manufacture of tapered roller and ball bearings, without the use of a single machine operator.

6278* A Geometrical Approximation to the Roots of Numbers. J. M. Barbour. *American Mathematical Monthly*, v. 64, Jan. 1957, p. 1-9.

Method is simple, works quite well for small numbers, and is especially advantageous for obtaining approximations to the successive powers of a root.

6279* On a Test for the Convergence of Fourier Series. Fu Cheng Hsiang. *American Mathematical Society, Proceedings*, v. 7, Dec. 1956, p. 1036-1039.

Two theorems are developed.

6280 Prescription Product Longevity. David D. Stiles. *American Pharmaceutical Association, Journal (Practical Pharmacy Ed.)*, v. 18, Jan. 1957, p. 30-32.

A chronological study of the date of origin most-frequently prescribed pharmaceutical products in 1955.

6281* On a Measure of the Information Provided by an Experiment. D. V. Lindley. *Annals of Mathematical Statistics*, v. 27, Dec. 1956, p. 986-1005.

A measure of the information provided by an experiment involves the knowledge prior to performing the experiment, expressed through a prior probability distribution over the parameter space.

6282* Comparative Toxicity of Stable Rare Earth Compounds. I. Effect of Citrate Complexing on Stable Rare Earth Chloride Toxicity. Joseph G. Graca, Edna L. Garst, and William E. Lowry. *Archives of Industrial Health*, v. 15, Jan. 1957, p. 9-14.

Comparative intraperitoneal toxicity studies of Ce, La, Nd, and Pr chlorides and their citrate complexes, made with mice and guinea pigs, show that complexing the chlorides enhances absorption and toxicity.

6283 Arctic Frontiers. United States Explorations in the Far North. John Edwards Caswell. 232 p. 1956. University of Oklahoma Press, Norman. (G625 C27a)

History of expeditions during period 1850 to 1909.

6284 Putting the Sun's Heat to Work. *Business Week*, Jan. 26, 1957, p. 118-120, 122, 124.

Wide commercial use of solar energy as a source of power is a long way off, but sunpowered furnaces are proving ideal for testing of jet and atomic materials at extremely high temperatures free of impurities.

6285 Contributions of Private Institutions of Higher Learning in Chicago to the Community and the Nation. 32 p. 1955. Commercial Club of Chicago. (LA228 C73c)

Addresses by three educators.

6286 Evaluating Low Sensitizing Perfumes. Raymond A. Osbourn, Thomas W. Tusing, Francis P. Coombs, and Edward P. Morrish. *Drug and Cosmetic Industry*, v. 80, Jan. 1957, p. 34-35, 108-115.

Tests indicate that 98.9% of our total population could use "Chemoderm" perfumes without dermatological reaction.

6287* First Electric Wrist Watch. *Electrical Manufacturing*, v. 59, Feb. 1957, p. 133-135.

New timepiece has no mainspring and employs a permanent-magnet motor, using the balance wheel as the rotor element with armature coil supplied with electric current from a lozenge-size energy cell with life of a yr.

6288 Engineering Structural Failures. Rolt Hammond. 224 p. 1956. Philosophical Library, New York. (TG260 H18e)

A survey of the causes and results of failures in a variety of structures such as dams, bridges, buildings, earthworks, tunnels, and welded ships.

6289* Toward a Humanistic Psychology. A. H. Maslow. *ETC.; Review of General Semantics*, v. 14, Autumn 1956, p. 10-22.

A psychologist enlarges upon his theory that the world's problems will yield only to a better understanding of human nature.

6290 Financial Protection Against Atomic Hazards. Arthur W. Murphy. 65 p. 1957. Atomic Industrial Forum, Inc., New York. (QC792 At71p)

Report on a survey of danger associated with the atomic energy program and possible solutions for the financial protection problem.

6291* Scrap—Industry's Big Handling Headache. Stanley S. Greene. *Flow*, v. 12, Feb. 1957, p. 63-79.

Modern methods of removal from machines, transportation to collection areas, and disposal.

6292* Progressive Integration of Handling, Packaging, Shipping, and Data Processing. *Flow*, v. 12, Feb. 1957, p. 80-83, 172.

Integrated operations mean increased productivity. An example of plant modernization is illustrated.

6293 Safe Operation Through a Pressure Vessel Testing Program. S. M. MacCutcheon. *Industrial and Engineering Chemistry*, v. 49, Feb. 1957, p. 89A-90A.

A definite program for testing pressure vessels to eliminate potential hazards.

6294* The Art of Color Matching. John C. Holle. *Interchemical Review*, v. 15, Autumn 1956, p. 59-73.

The physics, chemistry, physiology, and psychology of color. The job of the color matcher.

6295* Statistics in Engineering. Bernard Ostle. *Journal of Engineering Education*, v. 47, Jan. 1957, p. 410-414.

Use of statistics in design of industrial experiments. Statistical training for engineers.

6296* The Relation of Decision-Time to Stimulus Similarity. William N. Dember. *Journal of Experimental Psychology*, v. 53, Jan. 1957, p. 68-72.

Experiments show that the rank order of the members of a set of decision-times, each representing a single measurement from one subject can be successfully predicted from the similarity of the alternatives.

6297 An Introduction to Government Specifications. M. Barov. *Machine Design*, v. 29, Feb. 7, 1957, p. 76-80.

A check list of the types of armed services specifications currently in force.

6298 How to Apply Color in Design. Howard Ketcham. *Machine Design*, v. 29, Feb. 7, 1957, p. 83-90.

How to apply color for better marketability; anatomy of color; planning color patterns, selection factors, application ideas, and future trends.

6299 (German.) Materials Handbook. **Werkstoff Ratgeber.** Rauhut and Renesse. 514 p. 1956. Verlag W. Girardet, Essen, Germany. (TA403 R29w)

A survey of basic materials such as metals, alloys, ceramics, glass, wood, and plastics in relation to their characteristics, applications, standardization, commercial classification, and supply conditions.

6300* Stability of Periodic Time-Varying Systems. Louis A. Pipes. *Mathematics Magazine*, v. 30, Nov.-Dec. 1956, p. 71-80.

Mathematical analysis of the stability of a class of mechanical systems that contain time-varying parameters of a periodic type.

6301* An Elementary Approach to the Use of the Rate of Change Concept for Solving Problems. Raphael T. Coffman. *Mathematics Magazine*, v. 30, Nov.-Dec. 1956, p. 81-90.

6302* Overhead Conveyor System for Assembly of Travel Goods. *Mechanical Handling*, v. 44, Jan. 1957, p. 2-5.

A overhead conveyor circuit 900 ft. long, with tip-up carriers discharging automatically at preselected stations, carries subassemblies and raw materials, and links production lines and stores with the stations at which some 700 lines of finished products are assembled.

6303 The Microstructures of Diamond Surfaces. S. Tolansky. 67 p. 1955. N.A.G. Press Ltd., London. (QE393 T57m)

Powerful new optical techniques reveal the microtopographical structure in great detail.

6304* Applicability of a Precision Alignment Method. J. G. Doekes and W. de Bruin. *Microtecnic (English Ed.)*, v. 10, no. 5, 1956, p. 241-245.

Principle and applications of method permitting three points to be put on a straight line with an accuracy of the order of 0.2 sec. of arc for distances up to 50 m. or more.

6305* Extension of Uniformly Continuous Transformations and Hyperconvex Metric Spaces. N. Aronszajn and P. Panitchpakdi. *Pacific Journal of Mathematics*, v. 6, Fall 1956, p. 405-439.

6306* Convergence Topologies for Measures and the Existence of Transition Probabilities. Solomon Leader. *Pacific Journal of Mathematics*, v. 6, Fall 1956, p. 479-490.

Topology of simple compound and regular convergence. Transition probabilities for stochastic semigroups.

6307* Functionals Associated With a Continuous Transformation. Wm. M. Myers, Jr. *Pacific Journal of Mathematics*, v. 6, Fall, 1956, p. 517-528.

6308 Proceedings of the American Power Conference, v. XVIII. 665 p. 1956. Illinois Institute of Technology, Chicago. (TJ5 M58p Vis.)

A collection of papers dealing with various subjects associated with the generation, transmission, and utilization of power.

6309 Proceedings of the Symposium on "High Temperature—A Tool for the Future". 218 p. 1956. Stanford Research Institute, University of California, Berkeley. (TA460 Sy68p)

Consists of 36 papers pertaining to high temperature development, its containment, and high temperature processes.

6310 Random Functions: A Laplacian Random Function Depending on a Point of Hilbert Space. Paul Lévy. 10 p. 1956. University of California Press, Berkeley. (QA331 L57r)

6311* (German.) Protective Measures Against Gamma and X-Rays. **Vorschriften zum Schutz vor Röntgen- und Gammastrahlen.** G. Czesany. *Schweisstechnik*, v. 10, Oct. 1956, p. 131-134.

A study of the dangers of γ- and X-rays. Localized and general injuries incurred; maximum permissible weekly exposure.

6312 Science and Engineering in American Industry. Final Report on a 1953-1954 Survey. I. Research and Development Costs and Personnel. II. Factors Affecting Company Expenditures for Research and Development. 119 p. 1956. National Science Foundation, Washington, D. C. (TA157 N21scf)

The findings of a nationwide survey of industrial research and development conducted for the National Science Foundation by the U. S. Department of Labor's Bureau of Labor Statistics.

6313 Atomic Clocks. Harold Lyons. *Scientific American*, v. 196, Feb. 1957, p. 71-82.

The motions of atoms and molecules are absolutely pure and regular. Several atomic clocks have been developed which should permit establishment of a really accurate terrestrial time scale.

6314 Messengers of the Nervous System. Amedeo S. Marrazzi. *Scientific American*, v. 196, Feb. 1957, p. 86 + 6 pages.

Internal communication of the body is mediated by chemicals as well as by nerve impulses. Study of their interaction has developed important leads to the understanding and therapy of mental illness.

6315 Since Spindletop. A Human Story of Gulf's First Half-Century. Craig Thompson. 109 p. Gulf Companies, Pittsburgh. (HD9563.G8 T37s Over.)

A collection of narratives which illustrate Gulf Oil Co. policy from 1901 to 1951.

6316 Tested by Time. William J. Harshaw. 81 p. 1956. Harshaw Chemical Co., Cleveland. (HD9650 H25t)

Gives the reader a brief but comprehensive view of the present day Harshaw Chemical Co., its people, manufacturing plants, products and the uses to which these items are put.

6317* Cutting Characteristics of Dental Burs as Shown by High-Speed Photomicrography. Jack L. Hartley, Donald C. Hudson, William T. Sweeney, and Warren P. Richardson. *U. S. Armed Forces Medical Journal,* v. 8, Feb. 1957, p. 209-218.

Photographic techniques offer a more complete approach to study and design-improvement of rotating dental cutting instruments.

6318 Material Compatibility With Gaseous Fluorine. Harold G. Price, Jr. and Howard W. Douglass. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* E56K21, Jan. 1957, 5 p. (TL782 Un3rm Vis.)

Static tests showed only Teflon and ruby were compatible at 1500 psi.g. Several materials were found compatible at atmospheric pressure.

6319 Water for Industry. Jack B. Graham and Meredith F. Burrill, editors. 131 p. 1956. American Association for the Advancement of Science, Washington, D. C. (TD345 Am35w)

A symposium dealing with water resources and requirements, pollution problems, and waste disposal.

6320 Safety and Fire Protection. I. How Oil Burns and Why. J. L. Risinger. *World Oil,* v. 144, Feb. 1957, p. 52, 57-59.

Heat-wave characteristics of crude oil and how to determine them. Boilover and slopover reactions. (To be continued.)